A BIOARCHAEOLOGICAL STUDY OF LOCAL ROMAN IDENTITY: SKELETAL STRESS AND MORTUARY TREATMENT IN THE BUTT ROAD CEMETERY

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ABSTRACT

A BIOARCHAEOLOGICAL STUDY OF LOCAL ROMAN IDENTITY: SKELETAL STRESS AND MORTUARY TREATMENT IN THE BUTT ROAD CEMETERY

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This dissertation examines the development of local Roman identity in Britain and its relationship to skeletal health and mortuary treatment. The Butt Road cemetery, from Colchester UK, provides the main sample for this study. Previous researchers have suggested that 4th century AD burials from the Butt Road cemetery represent an early Christian community at Colchester. However, there is little supporting evidence of a distinct Christian mortuary ritual in the 4th century. The mortuary analysis in this study reevaluates proposed criteria for identifying Early Christian burials. A sample of 214 individuals from two temporal periods are used to examine possible changes in physiological stress levels and mortuary treatment of individuals based on age, sex, and social status over time.

The results of the mortuary analysis suggest that the people buried in the Butt Road cemetery had adopted a local Roman identity. The cemetery appears to be organized by family groups, and social status may be expressed through burial location within the cemetery and the presence of grave goods. This study shows that many other forms of identity are expressed in burial beyond religious belief. As a result, Christian burials cannot be confidently identified in the 4th century AD.

The Butt Road skeletal sample reflects a relatively ‘healthy’ population with low levels of dietary and environmental stress. However, when the Butt Road sample is

compared to contemporaneous skeletal samples from London and Cirencester, there is clear variation in skeletal health within the region. The significant differences in physiological stress between the Butt Road sample and the comparative samples suggest differences in local group identity as well as living conditions and management of the community infrastructure. Roman Colchester and Cirencester provided suitable living conditions to minimize physiological stress within the community, while London residents appeared to suffer from high levels of physiological stress.

To my parents
Linda and the late Dr. Allen L. Jenny DVM, MS

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Introduction: Biocultural Stress and Identity

This research examines the relationships between physiological skeletal stress indicators, mortuary treatment, and the expression of local Roman identity through a detailed reanalysis of the 1st through 4th century AD Butt Road cemetery, Colchester, UK. Human skeletal remains have been used to study disease and past life ways for several hundred years (Ubelaker, 1982). Over the last century, studies have increasingly focused on disease in an ecological context (Ubelaker, 1982; Goodman and Martin, 2002). The biocultural stress model introduced by Goodman et al. (1984 and 1988) has been used by many physical anthropologists to study the effects of cultural and environmental change on population health. The environment contains many natural stressors, including pathogens, climate conditions, and seasonal access to nutritional resources. Cultural change and inventions have allowed humans to overcome some environmental stressors by changing our natural environment to better suit our needs (Goodman et al., 1988). However, human manipulation of the environment can also have negative consequences, such as water pollution and resource depletion.

The effects of cultural and environmental stressors are often measured in terms of physiological stress as it is displayed in the skeleton (Goodman et al., 1984; Goodman et al., 1988). Goodman and Martin (2002) provide a discussion of physiological stress indicators used to investigate biocultural stress in *The Backbone of History* by Steckel et al. (2002). Physiological stress is generally the result of disease processes or growth disruption. Many studies have focused on the way in which physiological stress can be expressed in the skeleton and the types of environmental and cultural stressors responsible for these skeletal stress indicators. Some of the most common ways to study general physiological stress include comparisons of long bone length in adults and diaphyseal length in subadults. The presence of linear enamel hypoplasias, porotic hyperostosis and cribra orbitalia are also used to interpret disruption in growth and dietary deficiencies. Infectious disease has also played a major role in human evolution but relatively few pathogens visibly affect the skeleton (Ortner, 2003). Periostitis on long bones and maxillary sinusitis are indicators of non-specific inflammatory infections (Ortner, 2003; Roberts, 2007). These indicators may also be used to measure immune response to infections (Larsen, 1999). Multiple indicators of stress should be included in an analysis of skeletal stress in order to understand how skeletal stress is experienced over the course of an individual's lifetime and their effects on mortality (Goodman, 1993). Most importantly, skeletal remains need to be analyzed within an archaeological context in order to see how political, economic, and socio-cultural forces interact with ecology and biology to affect human health (Goodman and Martin, 2002; Goldstein, 2006; Knudson and Stojanowski, 2009).

Cultural identity impacts population health by creating systems for differential access to resources based on individual and group identity. Identity is essentially the way in which people perceive themselves at an individual and group level (Knudson and Stojanowski, 2009). Identity is related to an individual's social and biological age as wells their sex and gender (Knudson and Stojanowski, 2009). Political, economic, and religious views are incorporated into identity and can be expressed in a wide variety of ways (Knudson and Stojanowski, 2009; Klaus and Chang, 2009; Knudson and Blom, 2009; Buikstra and Scott, 2009). Identity, at both an individual and group level, can place restrictions on food or food choices and other resources. These identity-based restrictions can result in increased physiological stress for select individuals at particular times in their lives (such as during weaning). Over the course of an individual's lifetime their social persona can have a profound impact on their physical body (Robb, 2002).

Bioarchaeology provides an excellent framework within which to study both the physical remains and the social identity of individuals from past populations (Knudson and Stojanowski, 2009; Buikstra et al., 2005). By integrating physical anthropology, mortuary archaeology, and historical resources if available, anthropologists can gain a more holistic understanding of the life experiences of ancient people (Goldstein, 2006). The goal of this dissertation is to use a bioarchaeological approach to develop an understanding of life experiences in the Romano-British town of Colchester.

Limitations of this Study

There are several limitations to this study; these include the possibility of sampling bias and differences in data collection and reporting. Due to the size of the Butt Road cemetery, a sampling strategy is used for both temporal periods (described in Chapter Three). This sample is designed to represent males, females, and subadults and is drawn from all areas of the cemetery. However, it is possible that this sample does not accurately represent the rest of the Period 2 sample in terms of skeletal stress or mortuary treatment. While the Period 2 sample represents about 100 years of cemetery usage, this study does not attempt to analyze the sample in terms of order of burial. Slight shifts in grave orientation within Period 2 suggest that burials phases may be present within this phase of cemetery usage. These slight changes in orientation are not addressed in this study as it focuses on larger temporal changes between Period 1 and Period 2.

The comparative analysis included in this study relies on data sets collected by other observers. Differences between observers and the methods used to collect the data for these comparative samples may also affect the results discussed in this study. As mentioned in

Chapter Seven, some skeletal indicators were not fully reported in the original data sets. For example, maxillary sinusitis was observed in the London samples but the number of individuals with observable sinuses was not recorded in the database. The Bath Gate data set was also problematic because the number of observable individuals was not reported for LEHs, periostitis, and maxillary sinusitis. As a result, several variables had to be excluded from the analysis, which may influence the interpretation of skeletal stress in the Bath Gate sample, especially the stress levels of adults.

All of the samples used in this study are also affected by sampling bias inherent to archeological skeletal samples. The individuals buried in these cemeteries represent only a proportion of the total population of the towns associated with the cemetery. Burial rules may also exclude some individuals from being buried within these cemeteries or influence where their graves were located. Taphonomic factors and excavation strategies also impact the skeletal samples recovered from these cemeteries.

The full extent of the Butt Road cemetery and the other cemeteries included in this study are unknown. Urban development, previous excavations, and historical disturbances all impact the skeletal samples available for analysis from these sites. While portions of several Roman period cemeteries have been excavated in London, only the Butt Road cemetery and the Bath Gate cemetery have been systematically excavated in Colchester and Cirencester respectively. Archaeological surveys indicate that other Roman cemeteries existed around Colchester and Cirencester, but these have not been excavated to date. The London samples represent at least two cemeteries. These cemeteries were not completely excavated and the full extent of these sites is unknown. As a result, these skeletal samples may not completely reflect the population demographics and health of the entire communities that they are derived from, but may really only represent specific neighborhoods or social groups (funeral club members, cult members etc.).

The Butt Road Cemetery

The Colchester Archaeological Trust excavated the Butt Road cemetery in Colchester, UK from 1976-1979, with additional excavations in 1986, 1988, and 1997 (Crummy et al., 1993; Benfield, 1997). Over 700 burials were excavated at the Butt Road cemetery, making it one of the largest Roman period cemeteries excavated in Britain to date. The excavated burials were assigned to two temporal periods based on stratigraphy and changes in mortuary practices (Crummy et al., 1993). Period 1 consists of 61 graves spanning from the 1st to mid-3rd centuries AD. Period 2 includes over 600 burials dating to the 4th century AD. While the Colchester Archaeological Trust excavated a majority of the cemetery, a portion of the cemetery was excavated in the 19th century prior to the use of modern archaeological methods and little usable data is available from this early excavation (Crummy et al., 1993).

The Butt Road cemetery is associated with the Roman colony of *Camulodunum*, now modern Colchester. Both the cemetery and parts of the Roman town have been excavated, making it an excellent site with which to study the effects of local Roman identity on biocultural stress. The changes in burial practices from Period 1 to Period 2 may reflect a change in group identity in the late 3rd and early 4th centuries. As a result, Period 2 of the Butt Road cemetery has attracted the attention of scholars interested in identifying Christian cemeteries in the 4th century AD. However, these scholars tend to overlook other aspects of identity and agency expressed in burial practices outside of religious belief.

Britain in the Roman Empire

Prior to Roman conquest, permanent organized urban settlements in Late Iron Age Britain were rare and are generally associated with hill-forts (Haselgrove, 2004). In contrast, the Roman Empire relied on urbanism and daily interactions within public urban spaces, such as markets and forums to reinforce Roman identity across its extensive territory (Revell, 2009). As a result, when the Romans conquered Britain, they began to build towns as a means to reorganize the local population and begin the process of developing local Roman identity (Revell, 2009). Archaeological evidence of houses and public spaces in Roman-established towns such as Colchester and London indicate that traditional Roman architecture, including fora, basilicas, and temples were built soon after the communities were established (Jones, 2004; Crummy, 2001). In addition to the design of the public spaces, the emperor's image on coins and wall friezes in public buildings and the promotion of new religious festivals were also used to reinforce a new group identity as Romans (Revell, 2009).

The process of social reorganization and urban development under Roman rule created many new social and environmental stressors for the population of Britain. While no towns in Britain were as large as Rome itself or the other Roman cities of the eastern part of the Empire, they still had to deal with urban problems such as poor sanitation, water pollution, and food supply (Jones, 2004; Roberts and Cox; 2003).

Previous bioarchaeological research has found that skeletal stress increased in the Roman period in comparison with the Late Iron Age (Roberts and Cox, 2003; Redfern, 2003; Redfern, 2006; Peck, 2009). However, it is unclear if biocultural stress levels remained constant throughout the Roman period in Britain. Environmental and social stress may have been reduced in the 3rd and 4th centuries after Roman identity had been firmly established within the region

(Dark, 1994). Some communities may also have been better able to manage biocultural stress depending on population size and access to natural resources. (Dark, 1994; Millett, 1990)

Romano-British burial practices also become consistent with Roman views of death and burial. In the 4th century AD, burial practices change at Colchester and several other Roman cemeteries. What factors prompted the shift evident in mortuary practices and grave orientation in the 4th century is unclear, but several scholars have suggested that the spread of Christianity throughout the Empire may have played a role in these changes (Thomas, 1981; Watts, 1991). Diagnostic criteria for Christian burial practices were suggested by Watts (1991), but Philpott (1991) suggest that secular administrative changes in towns may have played a strong role in cemetery reorganization. By reexamining the Butt Road cemetery, it may be possible to identify changes in biocultural stress levels over time as well as the expression of identity in relation to social structure and religious practice.

Research Goals

Bioarchaeological studies rely on multiple lines of evidence, including skeletal remains, mortuary data, habitation data, and historical texts if available to develop a better understanding of life experiences and treatment after death in the past. The goals of this study address changes in skeletal health and mortuary treatment in a sample from the Butt Road Cemetery. The research questions are designed to address changes in skeletal health at multiple scales, i.e., from both an intra-site and inter-site perspective as well as the relationship between skeletal health and the expression of identity, including evidence for religious belief.

The four research goals are as follow:

1. Previous studies have shown that individuals in Roman period experienced significantly more physiological stress than individuals living in the Late Iron Age in Britain. However changes in

stress within the Roman period have not yet been explored. This study systematically examines biocultural stress between the early Roman period (1st-mid-3rd centuries) and the Late Roman period (4th century) by comparing Period 1 and Period 2 of the Butt Road cemetery.

2. This study explores the expression of individual and group identity at the scale of the cemetery by examining the spatial distribution of biological and mortuary variables using ArcGIS. This analysis provides insight into the population the cemetery sample was drawn from, including socioeconomic background and group identity.

3. Watts (1991) suggested a list of diagnostic criteria for identifying Christian burials. This study reexamines these criteria in relation to burial practices in the Butt Road cemetery and considers other ways in which the identity of both the agents responsible for burial and the deceased are expressed in funeral rituals.

4. This study compares the Butt Road cemetery to three other urban cemetery samples, Roman West and Roman South from London, and the Bath Gate cemetery from Cirencester, UK. This comparison examines stress levels between communities and provides a regional perspective of skeletal stress in Roman Britain.

The research questions, hypotheses, and expectations are summarized in Chapter Two.

Organization of Present Research

The main goal of this study is to develop a better understanding of biocultural stress within Roman Colchester. Chapter Two provides a brief history of Roman Colchester and the archaeological excavations that have taken place in and around the town. The theoretical models used to explain the development of local Roman identity are also discussed in Chapter Two. Then the development of Christian identity and the Church's role in secular events such as funerals is also explored in Chapter Two. Finally the research questions and expectations for this study are explained.

Chapter Three introduces the materials and methods used for this study. This includes how the sample was selected from the Butt Road cemetery, the methods used in data collection, including ArcGIS, and the comparative data sets used in this analysis. The results of the skeletal analysis of the Butt Road cemetery are discussed in Chapter Four, while Chapter Five presents the results of the spatial analysis of the cemetery and the reexamination of the criteria for Christian burial by Watts (1991). Chapter Five also discusses the differences in mortuary treatment between Period 1 and Period 2 as well as the spatial distribution of demographic groups and skeletal stress indicators within both temporal periods. Chapter Six introduces the idea of osteobiographies and discusses the life experiences of select individuals from both Period 1 and Period 2 of the Butt Road cemetery. These osteobiographies provide insight into the different life experiences of individuals buried in the Butt Road cemetery. The results of the inter-site comparison of skeletal health indicators between the Butt Road cemetery and London Roman South, London Roman West, and the Bath Gate Cemetery are discussed in Chapter Seven. The results of Chapters Four, Five, and Seven are integrated in a discussion of biocultural stress and local Roman identity at a macro-regional level in Chapter Eight. Finally, Chapter Nine summarizes the conclusions of this study and offers suggestions for future research.

Chapter 2 Historical Background and Research Questions

Introduction

The Butt Road cemetery from Colchester UK is used as a case study for health and mortuary practices in Roman Britain. This cemetery appears to be well organized and has been speculated to represent a Christian community. This study reconsiders the evidence for religious change by examining the skeletal stress indicators and mortuary treatment of individuals from this cemetery. Alternative explanations for increased organization of cemeteries in the 4th century AD will be explored later in this study.

Roman Colchester

The Butt Road cemetery lies just outside the walls of the Roman colony of Camulodunum, now the modern city of Colchester, UK. Colchester is recognized as Britain's oldest Roman town and is an important site for the study of the Roman occupation of Britain. Prior to the founding of the colony, Legion XX built a fortress at the site after the invasion of 43AD (Todd, 2004). As Roman conquest moved west and north, Legion XX was reassigned and a Roman colony was founded at Colchester in 49AD. During the first century AD, the legionary fortress was rebuilt into the Roman town. In 60/61 AD the town was burned to the ground during the Boudician Rebellion (Sealey, 1997). The town was rebuilt and during the course of the first and second centuries AD, Roman Colchester developed into a 'typical' Roman town (Wacher, 1995). A defensive wall was built around the town as part of the reconstruction process. Dates for the wall range between 80 AD into the 2nd century (Crummy, 2001). In addition, a basilica, theater, and the Temple to Claudius were also constructed near the center of town (Crummy, 2001). Houses within the town's walls became increasingly elaborate beginning in the 2nd century AD. Stone and brick buildings replaced wooden buildings and some excavated houses have elaborate mosaic floor, hypocaust heating and private baths (Crummy, 2001).

During the 2nd century AD, the town appears to develop suburbs and may have controlled a fairly extensive hinterland. The only cemetery from Colchester that has been thoroughly excavated is the Butt Road cemetery. Unfortunately, the graves discovered in the 19th century are poorly documented and skeletal remains were apparently not collected (Crummy et al., 1993). However, the general location of these cemeteries was documented and the grave goods allow the cemeteries to be dated. Based on M.R. Hull's work and later excavations, it appears that there were several large cemeteries around Roman Colchester. The cemeteries were concentrated to the south and west of the town (and seem to be associated with Roman period roads). There appears to be a trend for the cemeteries to move closer to the town walls over time. The Butt Road cemetery (mid 3rd through 4th century) is closest known cemetery to the town wall (Crummy et al., 1993).

The Colchester Archaeological Trust excavated the Butt Road cemetery from 1976-1979. Several smaller excavations were conducted in the 1980s and 1990s. The excavators divided the cemetery into two temporal periods based on stratigraphic differences and changes in mortuary treatment. Period 1 consists of 61 graves primarily from the mid-3rd century AD. Period 2 consists of over 600 burials from the 4th century AD (Crummy et al., 1993). Period 2 of the cemetery has attracted considerable attention as a possible Christian cemetery for several reasons.

At the north edge of the cemetery there is a foundation of a basilica with an apse at the east end. At the time of excavation, the building was interpreted as a church but Millett (1995) questions this interpretation. The building may also have served as a funerary feasting hall (Millett, 1995). In addition, Period 2 graves of the cemetery are oriented east –west, which has also become associated with Christian burial (Barlow, 1993). Both temporal periods appear to be organized in rows, although Period 2 contains more graves in very dense rows (Crummy et al., 1993). The Butt Road cemetery appears to be part of a trend of increased organization within cemetery space in the 4th century AD in Britain.

The present study is primarily focuses on the mortuary and possibly health changes associated with Late Antiquity, but the Romans controlled much Britain from 43-410 AD. Many studies have focused on the transition from Late Iron Age to Roman Britain and the Romanization process (Redfern, 2006; Peck, 2009; Roberts and Cox, 2003; Millett, 1990). However, sites like the Butt Road cemetery may be more helpful in understanding the end result of Roman occupation and provide insight into the transition to the “sub-Roman” period (5th and 6th centuries). Local Roman identity appears to be firmly in place by 410 AD, when the Empire gave up control of Britain due to political and economic turmoil in the Western portion if the Empire (Mattingly, 2006). Understanding the process of developing local Roman identity provides insight into how different communities may have responded to the end of Roman rule late in the 4th century.

Being Roman

In 212 AD, the Emperor Caracalla made all free men with in the Empire Roman citizens, and all women were granted the same rights as Roman women (Schott, 2008). By the time of Caracalla’s edict, Britain had been under Roman rule for several generations and archaeological evidence from Britain suggests that ‘being Roman’ had been integrated into individual and group identity (Revell, 2009).

While many scholars have used the term ‘Romanization’ to describe this process, this dissertation will try to avoid using this term for several reasons. ‘Romanization’ implies a one-way spread of ideas from the ‘civilized Romans’ to the barbarians (everyone else). In addition, it tends to overlook regional variation in favor of evidence of assimilation and acceptance of Roman authority and material culture (Woolf, 1998; Webster, 2001; Revell, 2009).

When variation is found, either between regions or between demographic groups, then scholars begin to debate which group was “more Roman” (Revell, 2009). Models for Romanization including Millett (1990) focus on a top-down approach. The (male) elites of newly conquered provinces adopt Roman material culture and political authority as a means of maintaining their own power and status (Millett, 1990). However, one of the problems with this model is that it largely ignores a vast majority of population. Women, freemen, slaves, and children also integrate ‘Romaness’ into personal identity but without the same potential to gain status and power as that of elite males. This could result in differential access to food resources and risk of infection or injury. In order to understand the mortuary treatments and biological relationship between Roman identity and demographic groups, a better model is needed to explain the development of Roman identity in all social groups, not just elite males.

Revell (2009) provides one of the best models for the development of Roman identity throughout the Roman Empire. According to her model, living in and around Roman towns resulted in the integration of ‘Romaness’ into personal identity through routine interactions with components of the Roman system. The three main components to the development of a ‘Roman’ routine are urbanism, the Emperor, and religion (Revell, 2009). Urban planning, the widespread use of the Emperor’s image, and the development of ritual space all helped to create a ‘Roman’ identity by reinforcing Roman power while allowing for variation in how these components were used within different regions of the Empire (Revell, 2009). This approach recognizes the role of agency in the development of identity and tries to avoid a “pre-conceived blueprint of what Roman was” Revell, 2009:38). While Revell (2009) has provided an excellent model to understand “being Roman”, the study of early Christianity has not been reexamined in the same way. Modern understanding of Christianity heavily influences historians’ interpretations of Early Christianity and may result in misinterpretations of the development of Christianity in Late Antiquity.

Becoming ‘Christian’

One of the main problems with the study of early Christianity is the desire on most researchers part to find a clear divide between Pagan (non-Christian) and Christian. These researchers want to find qualities that are unique only to Christians in architecture, iconography, and mortuary rituals by the 4th century AD. However, ‘Christianization’ is just as problematic a term as ‘Romanization’ for many of the same reasons.

Christianization implies a uniform conversion throughout the Empire with standardized rituals, texts, architecture, and iconography. However the problem with this idea is that that this level of uniformity did not exist in the 4th century AD, and its uncertain the degree to which this existed even in the Medieval period in Western Europe (Bullough, 1983; Paxton, 1990; Williams, 2006). Young (1975) suggests that religious mentality and mortuary practices do not have a one-to-one correlation; which means that historians and archaeologists cannot rely on mortuary evidence to identify the religion of the deceased.

Young (1975) examined Christian conversion in 6th century France and found that burial practices remained ‘pagan’ while contemporaneous historical textual evidence indicates that the population converted to Christianity. Young (1975) explains the divide between mortuary practices and religious conversion by trying to identify the agents responsible for burial and cemetery maintenance. Family members were responsible for the actual burial of deceased, not the Church. As a result, mortuary practices changed slowly because Church did not involve itself in actual burial practices until later in the medieval period (Young, 1975; Paxton, 1990). The role of the Church, not only in death but, in other important events such as marriage, is often over emphasized based on our modern conceptions of the power of the Church (Young, 1975). However, in Late Antiquity and the early medieval period, the Church left these rites of passage in secular hands and only involved itself in the actual rituals when these threatened its authority (Young, 1975).

What many scholars who believe that early Christianity is identifiable in burials seem to forget is that in order to successfully gain converts, Christianity had to borrow extensively from existing traditions. For example, modern Christians celebrate the birth of Christ on December 25 (Christmas). This came from the cult of Mithras and the pagan festival ‘the Day of the Birth of the Unconquered Sun’ (Barlow, 1993). In order to legitimize Christianity and make it appealing to ‘Romans’, the Early Church used pagan festival dates and rituals. Slowly these lost their prior meanings and became ‘Christian’ (Barlow, 1993). The integration of local religious traditions with Christianity results in the development of many forms of Christianity rather than one single Christian identity. This idea of multiple Christian identities needs to be taken into account in the 4th century AD. Much of our understanding of Early Christianity is influenced by modern Christian dogma; which is itself a product of the Middle Ages and did not truly exist in the 4th century AD (Barlow, 1993; Rebillard, 2009). Applying these pre-conceived ideas of Christianity to cemeteries from the 4th century creates divisions that likely are not representative of the communities responsible for these burial grounds. Mortuary analysis of 4th century cemeteries provides an opportunity to better understand the expression of social and biological identities during this time period.

Mortuary Studies

The analysis of mortuary sites and their contents can provide anthropologists with far more information that just the events surrounding death (Charles, 2005; Chapman, 2005). The location of mortuary sites in relation to habitation sites, the geographic features of land selected for mortuary use, and the spatial distribution of individuals buried within the site all provide insight into the people responsible for the creation and maintenance of the site (Charles, 2005). Burials provide a glimpse of funeral rituals and the relationships between the rite of passage associated with death and everyday life (Morris, 1992).

Funeral rituals play an important role in community cohesion and help to reinforce social and cultural identities (Laneri, 2007). The construction of funeral ritual requires the group to which the individual dead belongs to combine elements of material culture (funerary objects, coffins etc.) with the dead body, mythological stories, religious beliefs, and songs and lamentations by the living into something that helps the group transform a negative event (death) into a positive experience (Laneri, 2007:5; Goody, 1962). It is clear cross-culturally that funeral ritual and burial practices change over time. The transition to Christianity would have required a modification of Roman and indigenous burial practices. Considering how much of Christian ritual was built off of existing ritual, it seems unlikely that an exclusively Christian funeral ritual would have existed in the 4th century AD. Cemetery organization cannot be explained exclusively through religious change in the 4th century. Instead, funeral rituals and mortuary space should be considered as part of a larger context of social activities within a community (Laneri, 2007).

Burial practices and mortuary space can be a key indicator of social, economic, and cultural transformation (Pearce, 2000). "The restructuring of the mortuary dimensions can be a useful resource in facilitating the redefinition of the social and cultural frameworks of a community that is changing forms of political and religious authority" (Laneri, 2007:6). Changes in mortuary practices are one means of identifying changes in community organization in the past. The human skeletal material from cemeteries provides insight into the biological effects of cultural change and as well as into community health and demographics.

Biocultural Stress and Skeletal Health

As previously discussed in this chapter, the Roman occupation of Britain would have introduced many cultural and environmental changes to the population of Britain. The biocultural stress model proposed by Goodman et al. (1984; 1988) provides a way to look at the biological effects of cultural forces. According to this model, environmental constraints such as pathogens, climate, and nutritional resources can be buffered by cultural systems. Examples of cultural buffers of environmental stressors range from water treatments plants, to the construction of houses, and the development of agriculture. At the same time, cultural systems can create new stressors such as limiting access to resources based on social status, or through increased population density, which allows pathogens such as tuberculosis to evolve into more severe forms. Both environmental stressors and cultural stressors impact the human immune system and its ability to resist infection and recover from disease. Exposure to either stressor can result in physiological disruption of normal processes. This can result in a visible indicator of stress on the skeleton and teeth (Goodman et al., 1988). Physiological indicators of stress will be discussed in greater depth in Chapter Three. These stress markers indicate disruptions of growth and disease (both specific and non-specific infections).

In bioarchaeological research, skeletal stress markers and other paleopathologies have been used to measure population health in the past. By studying the frequency of skeletal stress markers within cemetery samples, bioarchaeologists have been able to identify changes in stress over time and in relation to cultural developments such as the transition to agriculture (Goodman et al., 1988). However, skeletal stress indicators must be interpreted with caution.

Wood et al. (1992) introduced an osteological paradox that suggests that the presence of skeletal stress indicators may indicate that an individual was less frail (susceptible to death or disease) than individuals that died without developing skeletal stress indicators. However, Goodman (1993) responded to the osteological paradox by emphasizing that using a suite of skeletal stress indicators, rather than only one provides a better measure of health within a sample. The Global Health Index is an example of examining multiple stress indicators to develop a better understanding of population health (Steckel and Rose, 2002). In addition, the understanding of the etiologies behind skeletal stress indicators has improved as molecular and clinical research has been incorporated into paleopathological research (Walker et al., 2009; Mays et al., 2001).

The goal of many bioarchaeological studies is to better understand health in relation to cultural influences. This study combines skeletal analysis with mortuary analysis and historical and archaeological data to examine stress in relation to Roman identity. As previously discussed, being Roman would have been a different experience based on age, sex, and social status. There are also biological effects of an individual’s social identity due to differential access to resources, exposure to disease, and risk of traumatic injury. Combining the skeletal analysis with an analysis mortuary treatment can provide insight into the relationship between individual and group identity and the health of an individual or group. The following section introduces the research questions and expectations of this dissertation.

Introduction to Research Questions

This section presents the research questions, hypotheses, and expectations of this dissertation. The bioarchaeological approach used in this project builds upon existing literature in physical anthropology, bioarchaeology and classical literature by incorporating a spatial mortuary analysis into the results of the skeletal analysis of the Butt Road cemetery. It uses the idea that changes in mortuary space usage often reflect larger changes in society (Rakita and Buikstra, 2005). There is an increasing trend to reexamine our understanding of early Christianity and the degree to which it influenced social and political developments in Late Antiquity. This reexamination calls into question previous attempts to identify diagnostic mortuary practices of religious beliefs. Instead, this analysis focuses on the agents responsible for burials and the range of social identities being expressed within a mortuary context.

By examining burial practices in conjunction with social status, family groupings, sex, age, and skeletal health indicators, this study explores the relationship between social identity and differences in health and mortuary treatments found in the Late Roman period. The goal of this study is to expand knowledge of health and mortuary practices of 1st to 4th century AD Romano-Britain using the Butt Road cemetery as a case study.

The research questions for this dissertation are as follows:

1. Do the prevalence rates of skeletal stress indicators differ between Period 1 and Period 2 of the Butt Road cemetery?

2. What are the relationships between individual (sex, age, etc.) and group identity (as they are expressed through mortuary practices) and skeletal health?

3. Are the criteria developed by Watts (1991) capable of identifying Christian burials in the 4th century AD?

4. Does skeletal stress differ between the Butt Road Cemetery sample and other contemporaneous Romano-British skeletal samples from Cirencester and London?

Expectations of Research Questions

Hypothesis 1a

The Period 2 sample will have lower prevalence rates of indicators of physiological stress and infections than the Period 1 sample.

The skeletal stress indicators selected for comparison in this study provide insight into physiological stress, diet, and infection and will be discussed in greater detail in Chapter Three. Linear enamel hypoplasias (LEH) are one of the best ways of measuring the possible differences in treatment between adult males and females during early childhood (Steckel et al., 2002). Cribra orbitalia is an indicator of dietary deficiency, which often affects subadults (Walker et al., 2009). Non-specific infections, such as periostitis of the tibiae, can provide insight into the effects of psychosocial stress and its effect on the immune's system ability to fight infection (Goodman et al., 1988; Cohen, 1988.) Previous bioarchaeological research using periostitis has found that it can vary by sex and age group and can provide insight into the division of labor (Lallo et al., 1978).

Maxillary sinusitis is a non-specific infection that provides insight into culturally induced stressors such as the effects of house styles on air quality (Merrett and Pfeiffer, 2000). Roberts (2007) found that females were more likely to be affected by maxillary sinusitis than males and that rural populations were more likely to be affected than urban populations using a broad range of samples from Europe, North America, and Africa. In some of these populations, females spent more time inside houses with poor ventilation while males spent more time outdoors (Roberts, 2007). Roman populations may experience a different pattern of infection due differences in housing styles. While Roman women would still spent much of their time within the home, specialized occupations such as pottery production may have caused a shift in the amount of time men spent indoors as well. This may result in a more equal exposure to poor air quality and similar levels of sinusitis between the sexes.

The comparison of long bone lengths in adults can provide insight into the overall effects of stress during growth and development. Comparisons of dental age estimates and diaphyseal length in subadults provide insight into nutritional status and physiological stress at different points in development (Goodman and Martin, 2002; Bogin, 1988).

As mentioned previously, there are two distinct temporal periods within the Butt Road cemetery. The majority of the burials from Period 1 date to the 2nd and 3rd centuries AD, well after the foundation of the town in 49AD. Archaeological evidence from several Roman towns in Britain suggests that Period 1 (1st-3rd centuries AD) was a period of transition, including the development of local Roman identity (Revell, 2009). During Period 1, the cultural stress introduced by Roman conquest and reorganization may have outweighed any potential benefits of Roman engineering and urban development. However, during Period 2 in the 4th century AD, Roman towns in Britain were well established. People living in Romano-British towns in the 4th century appear to have developed a local Roman identity and accepted Roman rule. This acceptance may have resulted in a reduction in psychosocial stress as people learned to live within the confines of Roman identity. Roman urban engineering may have reduced some environmental stress by providing clean water via aqueduct-fed public fountains and other sanitation changes. This combination may have reduced skeletal stress within the Period 2 sample.

People living in Roman Colchester during Period 2 also lived in a different political and economic atmosphere than their predecessors. The 4th century marks the beginning of decentralization of the Roman Empire, an increased focus on local trading networks, and the transition to Christianity as an imperially supported religion (Dark, 1994).

Dark (1994) discusses political and economic changes that could impact population health. He suggests that decentralization of the Roman Empire may have improved some towns' ability to maintain public infrastructure. Local elites were responsible for providing financial support for public buildings and other resources (Dark, 1994; Brown, 1992; Brown, 1995). At the same time, there is a shift from Empire wide trade networks to smaller, regional based trade. Smaller urban centers may have benefited as the economic focus shifted away from larger economic capitals such as London.

The 4th century is also an important period for religious change. Historical sources suggest that the introduction of Christianity may have had a positive effect on population health through missionary efforts to care for the sick and provide for the poverty stricken (Avalos, 1999).

These factors can all contribute to a shift in the frequency of physiological stress markers in Period 2 of the Butt Road cemetery in comparison with Period 1. In order to identify potential differences in skeletal health, Period 1 adults, males, and females are compared to Period 2 adults, males, and females. Period 1 has very few subadults so it is difficult to compare prevalence rates between subadults from Period 1 and Period 2.

The Period 1 sample encompasses the transition to "Romaness", urban development, and imperial control. As a result, the Period 1 sample is expected to have higher levels of LEH, cribra orbitalia, and periostitis than Period 2 sample. The long bone lengths of individuals from Period 1 are expected to be shorter than in Period 2. Period 2 females should have lower prevalence rates of physiological stress and infection than Period 1 females. The males from both temporal phases are expected to have similar frequency for skeletal health indicators.

Hypothesis 1b

There will be differences in the frequency of skeletal health indicators between males, females, and subadults in the Period 2 sample.

The Roman Empire was patriarchal in nature. A male head of the household was required to represent the family for legal and economic transactions (Morris, 1992). As a result, male children probably would have gotten preferential treatment over female children. This could result in skeletal health differences displayed by adult males and females (especially LEHs). Women primarily worked within the domestic sphere and may have been more strongly affected by household environmental stressors (such as poor air quality). Females may be more likely to have maxillary sinusitis than males as a result.

Individuals who died before reaching maturity may have higher levels of cribra orbitalia and LEHs than individuals that survived to become adults. Both of these stress indicators develop during childhood. Although LEHs are permanent, cribra orbitalia will heal over time so that individuals who survive well into adulthood may have no visible indicator that they once suffered from the condition. Walker et al. (2009) tie cribra orbitalia to dietary deficiencies, especially vitamin deficiency, so an improved diet may allow the condition to heal. Subadults who died with these indicators present may have been more susceptible to other pathogens due to previous physiological stress (Boldsen, 2007).

Hypothesis 2

Individual and group identity will play a role in how skeletal stress rates and infections are distributed throughout the graves from each period within the cemetery.

Within each period of the Butt Road cemetery, individual and group identity will affect prevalence rates of skeletal stress and infection. Sex, age, familial or group membership all play an important role in an individual's identity and also affect their ability to ensure access to critical nutrients and limit their exposure to disease. Spatial analysis of the cemetery provides a way to look at the demographic distribution of individuals within the cemetery as well as the intensity of the distribution of variables (clustered, random, or regular). The Butt Road cemetery is highly organized and likely had rules for who was buried where. This analysis may provide insight into these rules, including if burial location is based on age, sex, family groupings, or order of death.

Males and females should be evenly distributed throughout all areas of the cemetery. Previous research has not found evidence of segregation by sex within Roman period cemeteries (Philpott, 1991; Morris, 1992). Males and females are compared within and between temporal periods to identify differences in health. Males are expected to have lower prevalence rates of skeletal stress indicators than females based on the patriarchal nature of Roman society.

While it is difficult to compare Period 1 and Period 2 subadults, it is possible to compare between subadult age divisions (infant, early child etc.) in Period 2 for differences in skeletal stress and mortuary treatment. Subadults are also compared to adults to identify age groups most vulnerable to specific stress indicators. For example, subadults are expected to have higher levels of cribra orbitalia than adult males or females. Subadults appear to be more vulnerable to the physiological processes responsible for cribra orbitalia (Walker et al., 2009). However, subadults in Period 2 are expected to have low levels of periostitis of the tibia in comparison with adult males and adult females. Individuals have to live with infection for a long period of time in order to develop periostitis. Subadults in this sample may have died before they could be exposed or develop periosteal reactions from infection. In turn, adults may be more likely to participate in activities that could result in injuries to the tibia and result in periostitis.

The spatial distribution of subadults within the cemetery is an important part of this study. Infants are often excluded from formal cemeteries in the Roman period and young children may be segregated to one area of the cemetery such as in Yasmina in Carthage (Norman, 2002). Period 2 of the cemetery is known to include infants but the distribution of subadults in relation to other burials has not been explored in detail.

Spatial analysis of the cemetery may reflect key differences in health markers and burial treatments. An analysis of grave goods in relation to demographics and skeletal health indicators may provide insight into social status. Individuals buried with grave goods are expected to have lower frequencies of skeletal health indicators than individuals buried without any type of grave good.

Hypothesis 3

Watt's criteria for identifying Christian burials are not sensitive enough to identify religious change.

Identifying Christian burials in Late Antiquity is very difficult because there is no clear Christian mortuary tradition prior to the Early Middle Ages (Rebillard, 2009; Paxton, 1990). Christian burial practices and mortuary treatments reflect a mixture of Roman, local, and Jewish traditions (Rebillard, 2009). Rebillard (2009) suggests that Christians did not develop specific mortuary traditions until the Early Middle Ages and doubts that Christian burials can be confidently distinguished from non-Christian burials in the 4th century AD. Watts (1991) developed criteria she used to identify Christian burials in Roman Britain. However, these criteria are based on accepted Christian burial practices from the medieval period (Paxton, 1990; Thomas, 1981). Watts' (1991) criteria for internal evidence of Christian cemeteries are summarized as follows:

1. The occurrence of infant or neo-natal burials in cemeteries in the fourth century AD.
2. The presence of "Christian" iconography, inscriptions and symbols present on artifacts from the cemetery.
3. The organization of the cemetery including: east-west alignment of graves, body position, and coffin type.
4. The absence of decapitated burials.
5. The presence of a mausoleum or burial enclosures.
6. The absence of grave goods and if present, the type of grave good is considered.

Watts assigned a value to each of these criteria and evaluated the site reports of excavated cemeteries based on the degree to which they met these criteria (Watts, 1991). Period 2 of Butt Road was the second highest scoring cemetery for internal evidence of Christianity (Watts, 1991).

A number of authors have questioned the validity of these criteria (Philpott, 1991; Petts, 1998; Quensel-von-Kalben, 2000). More recent discussion of Christian burial practices in the fourth century AD implies that Watts' criteria may not be sensitive enough to truly distinguish Christian burials from non-Christian burials. Rebillard (2009) presents a strong argument against the existence of exclusively Christian cemeteries in the 4th century AD. So while Watt's criteria do appear to suggest that a change in mortuary practice is taking place in cemeteries like Butt Road, it ignores the negotiation between religious belief and religious practice (Petts, 1998). Many other social changes and social identities may also be influencing the mortuary rituals occurring during this time period (Petts, 1998).

Hypothesis 4

The population from the Butt Road cemetery will differ in skeletal stress from other Romano-British cemeteries.

The mortuary treatment within the Butt Road Cemetery may reflect different social identities than those expressed in the burial practices from the London cemeteries and the Bath Gate Cemetery in Cirencester. These communities appear to develop and maintain slightly different mortuary practices than Butt Road and this may reflect differences in the communities' political and economic roles within Roman Britain. Taking this into consideration, the Butt Road cemetery sample is compared to three other Romano-British skeletal samples. Any differences in health between these samples may be a reflection of larger differences in community organization and access to resources.

Previous studies have identified differences in prevalence rates in the different age groups and sexes between these communities (Roberts and Cox, 2003; Redfern and Roberts, 2003). Children and adolescents from the Butt Road sample are expected to have lower prevalence rates of cribra orbitalia and LEHs than similar age groups from London and Cirencester (Redfern and Roberts, 2003). Adult males and females from the Butt Road sample are expected to have lower prevalence rates for LEH, cribra orbitalia, and periostitis than adults from London and Cirencester. Long bone lengths are expected to be greater for Butt Road males and females than the London and Cirencester samples. Previous studies comparing "urban" cemeteries in Roman Britain have found significant differences between populations. Redfern and Roberts (2003) point out that house style and urban organization may play a key role in differences in population health. Roman style houses may have had better ventilation than traditional round houses, which could reduce respiratory infections. Access to fresh water from could have reduced water contamination and prevented or reduced parasitic infections, which could improve population health. Larger urban centers, like London appear to have a greater mixture of Roman and traditional architecture while smaller communities, like Colchester appear to have less variation in architecture styles.

Major economic and political centers such as London also likely have greater social status differences within its inhabitants than smaller towns like Colchester. Social status often dictates the type of housing individuals can afford and the resources they have access too, such as public fountains versus private wells.

The next chapter will outline the materials and methods that will be used to address the research questions and expectations discussed in this chapter.

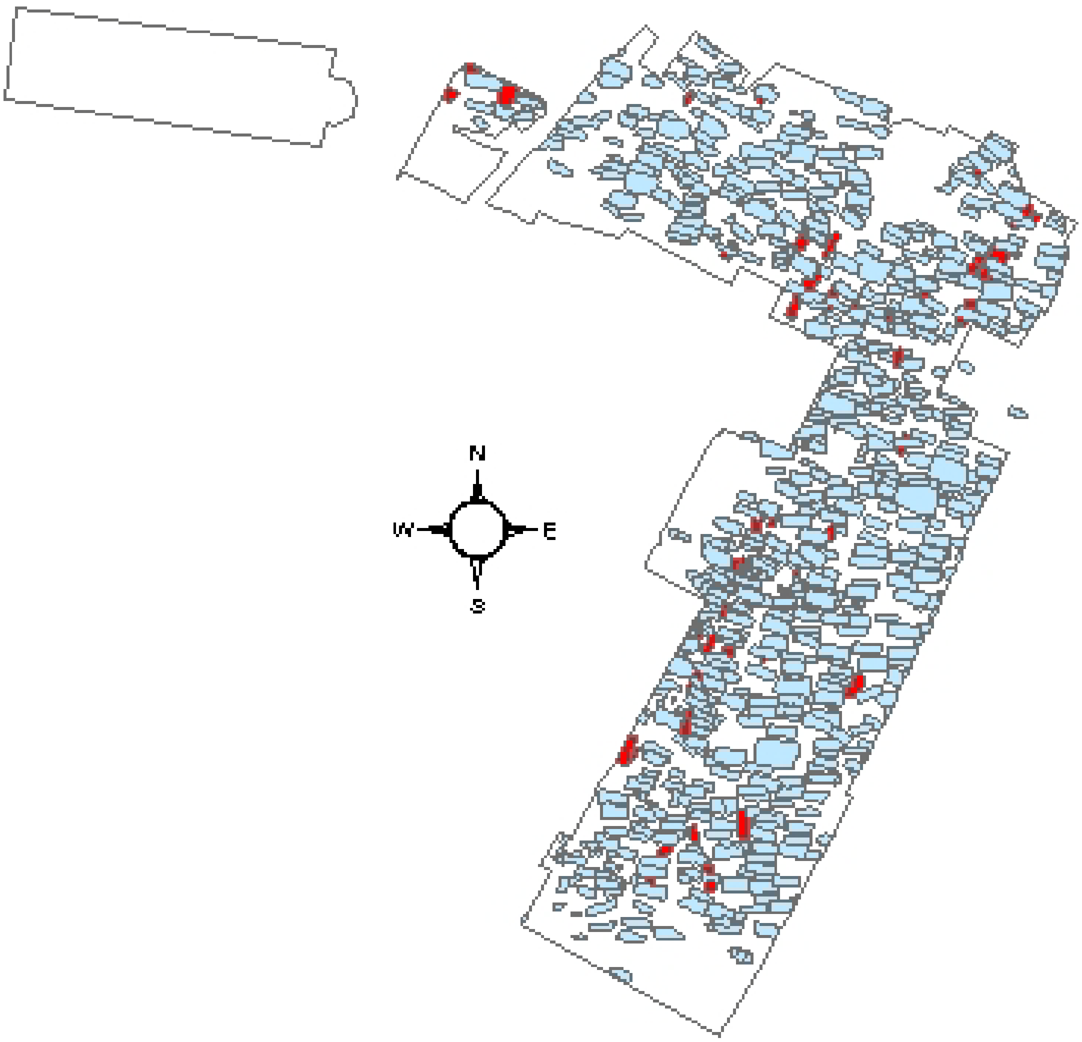
Introduction

This chapter introduces the skeletal material and mortuary data that are used to address the research questions and expectations discussed in Chapter Two. It also discusses the methods used to analyze the skeletal and mortuary data, including sampling strategies, and the indicators of stress that will be used in this dissertation.

Materials

The Butt Road cemetery from Colchester, England provides a unique opportunity to study an extensive skeletal collection in conjunction with mortuary and habitation archaeological data (Crummy et al., 1993). The Butt Road cemetery was located just outside the colony's walls and was in use primarily from the middle of the 3rd century AD until the end of the 4th century AD (Crummy et al., 1993). Crummy et al. (1993) divided the cemetery into two temporal periods based on grave orientation and stratigraphy. Period 1 is represented by 61 graves with a north/south orientation. Period 2, which consists of approximately 600 graves, overlies and often disturbs the graves of Period 1. Period 2 graves have an east/west orientation. The plans for the cemetery are digitized in ArcMap for analysis in this study (Figure 1).

Figure 1: The Butt Road Cemetery[1]



[1]The digitized site map based on Crummy et al. (1993). Period 1 graves are displayed in red. Period 2 graves are displayed in blue. For interpretation of the references to color in this and all other figures, the reader is referred to the electronic version of this dissertation.

The preservation of the skeletal material varies from very poor to excellent. Some graves contained very small cortical fragments or soil stains of where a skeleton had been located. Period 1 graves were frequently disturbed by graves from Period 2 and as a result, skeletal preservation is quite poor in the Period 1 sample. In Period 2, preservation ranges by area within the cemetery. Skeletons in the northern area of the cemetery are generally more fragmentary and weathered than skeletons from the southern portion of the cemetery. The most preserved skeletons generally come from the middle area of the southern portion of the cemetery. Due to the size of the Butt Road skeletal collection and varying levels of preservation, a sampling strategy is used for this study.

Sampling Strategy for Period 1

There are 61 Period 1 graves but only 46 of these graves contained sufficiently preserved skeletal material to be included in the Period 1 skeletal analysis (discussed in Chapter Four). However, all 61 graves will be included in the mortuary analysis of Period 1 (discussed in Chapter Five).

Sampling Strategy for Period 2

The original skeletal report by Pinter-Bellows (1993) assigned burials to male, female, subadult, and no age or sex categories (Crummy et al., 1993). According to Pinter-Bellows (1993), Period 2 consists of 170 males or probable males, 140 females or probable females, and 108 subadults, in addition to 157 individuals for which age and sex could not be determined. The sample from Period 2 is based on a stratified proportional random sampling strategy. The goal of the sampling strategy is to examine males, females, and subadults using a sampling fraction at or above 20%. This strategy meets the criteria for most parametric statistical tests, provided the data is distributed normally.

The grave numbers of skeletons previously assigned as males, females, and subadults are randomly selected for inclusion in this study. Skeletons from the no age/sex category are not included in the sample. Because some skeletal material is not available (on display at the museum etc.), additional skeletons are selected from each category to meet the sampling goal if necessary. The goal of the Period 2 sampling strategy is to analyze a minimum of 35 females, 41 males and 44 subadults. These would represent 25% of females and males respectively and 40% of subadults based on Pinter-Bellows (1993) report.

Methods

Data Collection

Inventory

An inventory of skeletal elements is recorded for each skeleton in this sample using the appropriate inventory diagrams from Standards (1994). The inventory includes the presence and completeness of the skeletal material available for each individual. A dental inventory and basic dental chart is also recorded for each individual. This includes presence/absence of each tooth, if the tooth was lost antemortem or postmortem, LEHs, dental wear, caries, calculus, peri-apical abscesses, and periodontal disease.

Reassessment of Sex and Age

The present study reassessed sex and age in addition to skeletal stress indicators. The following categories are used: female, probable female, ambiguous (displayed both male and female characteristics), male, probable male, unknown adult (no age or sex could be determined due to poor preservation), and subadult. Ambiguous refers to individuals that fell in the indeterminate range between male and female but were complete enough to be aged. Unknown adult refers to individuals for which neither sex nor age could be determined due to poor preservation.

The Period 2 sample is selected based on the original bone report’s assessment of sex and age (Pinter-Bellows, 1993). However, the re-assessment of sex and age does not always agree with the original observers. There are at least 28 graves that either sex or age differs from the original report. Three of these graves contain commingled remains (MNI=2) that are not acknowledged in the original site report. In many cases it is unclear what criteria the original observer(s) used to determine sex or age. There is no discernable pattern of difference between the original observer(s), although there are two instances where individuals originally sexed as males are re-sexed as females based on pelvic and cranial morphology. Poor preservation played a major role in the reanalysis, resulting in more conservative sex and age assignments than the original observers.

Adults in this sample are primarily aged using degenerative changes visible on the auricular surface (Lovejoy et al., 1985; Meindl and Lovejoy, 1989; Bedford et al., 1989). Pubic symphyses and sternal rib ends are rarely available for observation in this collection but the auricular surface is consistently preserved. The auricular surface is assessed using the descriptions and photographs in Standards (Buikstra and Ubelaker, 1994; Lovejoy et al, 1985). If available, the pubic symphysis is also used to age adults (Brooks and Suchey, 1990; Suchey and Katz, 1998; Katz and Suchey, 1986). For individuals that do not have auricular surface or pubic symphysis, then the degree of dental wear, the presence of osteoarthritis, and cranial suture closure are used to help assess age (Buikstra and Ubelaker, 1994).

The sexes of the adults in this sample are reassessed using the Phenice (1969) method and the features of the cranium. The width of the sciatic notch, and the arc compose´ also aided in determining sex as the ischium is frequently preserved in this collection (Phenice, 1969; Steckel et al., 2006; Ascadi and Nemeskieri, 1970).

Subadults are aged using dental development and epiphyseal fusion (Ubelaker, 1984; Ubelaker, 1989). No attempt is made to estimate sex in subadults because of the lack of accepted standards for sexing subadult skeletal material (Buikstra and Ubelaker, 1994).

Skeletal Indicators of Stress

Goodman et al. (1988) emphasize the need to evaluate multiple stress indicators within a population in order to develop an understanding of the total stress load of a given population. This strategy should allow investigators to determine if stress is chronic or acute and what age group is most affected. Stress indicators used for this analysis include: a) linear enamel hypoplasias (LEH), b) cribra orbitalia c) periostitis d) maxillary sinusitis e) maximum long bone length of femora/tibiae. Indicators of specific infectious disease, such as vertebral lesions or vertebral collapse, are recorded if present (Ortner, 2003). Porotic hyperostosis is excluded from this analysis because a pilot study for this dissertation found that erosion of the external cranial surface was very common within the Butt Road collection, making it difficult to distinguish between post mortem change and true porotic hyperostosis.

Linear Enamel Hypoplasias

Linear enamel hypoplasias (LEH) represent a periodic disruption of enamel matrix secretion during the development of the teeth (Ritzman et al., 2008). Past research has focused on the relationship between LEHs and weaning. However this has been based on macroscopic methods of estimating the age when LEHs occurred. More recent histological studies have shown that macroscopic methods underestimate age by at least 6 months and often even longer. Ritzman et al. (2008) found that macroscopic methods placed a majority of LEHs in a Sudanese sample between 2.5 and 4.5 years while a microscopic method put the LEHs between 4.5 and 5.5

years. While this reduces the impact of weaning as a factor, Ritzman et al. found a strong correlation between early infections of parasites, in particular schistosomiasis, and LEHs.

This suggests that LEHs may be a better reflection of early responsibilities assigned in childhood and the risks for infection associated with these tasks. Cross-cultural studies of modern children's work find that children contribute to the productivity of their household beginning at an early age. Two trends have been identified cross culturally regarding children's work; children tend to do work appropriate for adults of their gender, and children are assigned "women's work" more often than "men's work" (Bradley, 1987). Differences in LEHs between males and females in these circumstances may be less representative of weaning and food choices, and may instead reflect the differences in duties assigned or types of play allowed.

In addition, Boldsen (2007) studied the relationship between LEH and mortality rates in adults using the Danish medieval site of Tirup. Boldsen compared mean age-at-death for individuals with LEHs and without LEHs. Boldsen found that the presence of LEHs in adult males increased their frailty in comparison with males with no visible LEHs. However, in females this was only true to about age 20. Then the effects of reproduction on mortality appear to outweigh the possible consequences of LEHs in adulthood. Based on Boldsen's study, the analysis of LEHs in adults can provide insight into both events that occurred early in childhood, and the possible lifelong consequences of LEHs on frailty and mortality.

Following Buikstra and Ubelaker (1994), linear enamel hypoplasias are scored by individual and by tooth. All anterior teeth (incisors and canines) are examined with strafing light for the presence of linear enamel defects. If an LEH can be felt with a fingernail, then it is recorded as present (Steckel et al. 2006). Then the distance from the cemento-enamel junction and the middle of the LEH is measured (Buikstra and Ubelaker, 1994). If a tooth has multiple

LEHs, then the number of LEHs per tooth is recorded, and the distance between the CEJ and the LEH is measured for each defect. If an individual has no anterior teeth or severe dental wear, then the individual is considered unobservable.

Linear enamel hypoplasias are reported per individual in this sample (Temple, 2010; Lukacs, 1992). Although anterior teeth are differentially affected by LEHs, this sample is not large enough to breakdown LEHs to tooth type and class and still have cell sizes large enough for statistical analysis. The prevalence of linear enamel hypoplasias per individual is calculated by the number of individuals affected divided by the number of individuals with observable anterior teeth. This is calculated for the entire sample and then broken down by temporal period, age and sex categories. The decision to report the individual count is also based on the focus of this study. One of the goals of this study is to compare the stress of the individuals interred in the Butt Road cemetery to contemporaneous samples. Other indicators of stress are reported at the individual levels, so this maintains consistency between variables and also allows for inter-site comparison (Lukacs, 1992).

Cribra Orbitalia

Cribra orbitalia has been tied to a combination of factors including dietary insufficiencies, parasite load, trauma or infection of the eye orbit, and more recently scurvy (Walker et al 2009). While many researchers have tied porotic hyperostosis and cribra orbitalia to iron deficiency anemia, Walker et al. (2009) suggest this assumption is incorrect. Instead, Walker et al. relate porotic hyperostosis to hereditary and megaloblastic anemias, which destroy mature red blood cells resulting in expansion of the marrow to produce more red blood cells (2009). While hereditary anemias are limited to specific geographic regions/population groups, megaloblastic anemias are related to chronic dietary deficiencies, especially malabsorption or lack of vitamin B12/folic acid (Walker et al., 2009).

Although many previous studies have approached cribra orbitalia and porotic hyperostosis as representing the same condition, more recent research suggests that these lesions may be the result of two distinct physiological processes related to very different etiologies (Stuart-Macadam, 1985; 1987; 1989; Sullivan, 2005; Walker et al., 2009). Cribra orbitalia and porotic hyperostosis do not occur together in all cases. Cribra orbitalia is more commonly reported than porotic hyperostosis and seems to have a more complicated etiology (Walker et al. 2009). Cribra orbitalia can be the result of “anemia-induced marrow hypertrophy” but can also be caused by subperiostial bleeding associated with scurvy, rickets, and traumatic injuries (Walker et al., 2009). Subperiostial bleeding is more likely to occur in children because the periosteum is less firmly attached to the bone and vitamin C deficiency (scurvy) weakens these fibers further. Trauma associated with movements from the ocular muscles causes subperiosteal bleeding and new bone development on the orbit roof. Walker et al. (2009) argue that cribra orbitalia is more often the result of a co-deficiency of vitamin C and B12. While gastrointestinal parasites, living conditions, and diet still play an important role in the development of cribra orbitalia, the focus on iron deficiency should be redirected to other areas of diet and lifestyle.

In the Colchester sample, erosion of cortical bone on the cranial vault is very common and makes it difficult to distinguish between taphonomic damage and true pathology. Given these circumstances, porotic hyperostosis is excluded as a variable in this dissertation. Instead, only cribra orbitalia lesions in the eye orbits are included in the analysis. Erosion of the cortical bone in the eye orbit rarely occurs in this sample so lesions observed are more likely to represent pathological changes rather than taphonomic damage.

Cribra orbitalia is scored using the standards developed by Buikstra and Ubelaker (1994) and Stuart-Macadam (1985; 1989). The presence of the right and left orbits is recorded for each individual in the sample. Individuals with at least one observable orbit are included in the analysis. If orbits are not present, then the individuals are considered unobservable. When cribra orbitalia is present the degree of expression and the activity (healed, active at time of death, or mixed reaction) is recorded (Buikstra and Ubelaker, 1994).

Periostitis

Periostitis represents a reaction to pathologic conditions in the underlying bone (Ornter, 2003). Periostitis can represent trauma or infection of the periosteum. It can be a sign of systemic infection or may be related to specific pathogens such as tuberculosis or other immunological responses (Ortner, 2003). Individuals with compromised immune systems due to biocultural or psychosocial stressors may be more susceptible to periosteal infections (Goodman et al., 1988). Cohen (1988) suggests that individuals with strong social support are more likely to have improved immune function while socially isolated individuals are more likely to have compromised immune functions.

Periostitis is scored following the recommendations of Buikstra and Ubelaker (1994). The cortical surface of long bones is often poor in this sample, especially in Period 1. For individuals with post-depositional erosion on the cortical surface of their long bones, periostitis is considered unobservable. If individuals have intact cortical surfaces but periostitis is not present, it is considered absent. If individuals have signs of periostitis, this is recorded by location, if it is sclerotic, reactive, or both, and then photographed. Periostitis is mainly observed on the tibiae, femora, and fibulae in this sample. Periostitis, like LEH, is considered at an individual level rather than by the skeletal element for this study.

Maxillary Sinusitis

Sinusitis is an indicator of severe upper respiratory tract or dental infections resulting from poor indoor air quality or dental health (Roberts, 2007). It can provide insight into culturally induced stress such as the effects of housing styles on air quality. It can also provide insight into the division of labor within domestic space. Past studies have found maxillary sinusitis to be more prevalent in females and rural agriculturally based populations (Roberts, 2007). In this study, sinusitis gives insight into potential differences in air quality and the division of labor.

Maxillary sinusitis is scored in individuals with exposed maxillary sinuses. Many maxillae have separated from the rest of the cranium, exposing the sinus floor, walls, and roof for inspection. In some cases, the maxillae are still attached to the rest of the cranium but the lateral wall of the sinus has been broken (either through taphonomic processes or by previous researchers) so the sinus can be inspected. If the cranium is completely intact, then the individual is considered unobservable in this study.

Maxillary sinusitis is scored based on the presence or absence of reactive bone in the sinus and its possible relationship to dental disease (i.e. did a dental abscess spread up into the sinus or does the infection represent an upper respiratory infection) (Roberts, 2007). Maxillary sinusitis is also recorded based on type of bony reaction present, as follows: porosity, spicules, lobules, cysts, and plaque (Roberts, 2007; Boocock et al., 1995). Reactions are recorded for both sinuses, if available, to see if the infection was bilateral or unilateral.

Long Bone Lengths

Long bone length is influenced by a combination of genetics and environmental agents. Genetics appears to be responsible for 75-90% of height (Goodman et al., 1984; Kemkes-Grottenthaler, 2005). Previous research has, essentially, shown that "the short die young" or that there is an inverse relationship between growth, health, and mortality, (Kemkes-Grottenthaler, 2005). Previous studies have found that the lower limb bones exhibit greater plasticity and greater reaction to nutritional stress or other health problems so focusing on the lengths of lower limb bones in relation to age at death and other stress indicators should provide better insight into the relationship between health and long bone length (Kemkes-Grottenthaler, 2005). Other studies have found relationships between long bone length and social status (Buikstra, 1976).

Several studies have compared subadult diaphyseal lengths with dental development to look at health. The idea behind these studies is that "the growth of a child reflects his or her health and nutritional status better than any other single index" (Saunders, Hoppa, and Southern, 1993). These studies allow dental age estimation to represent chronological age as research has shown that dental development is relatively consistent between populations and is less affected by secular trends (Hoppa, 1992). Diaphyseal length is plotted against dental development age. Many of these studies use modern longitudinal growth data from studies such as Maresh (1970) to compare past population growth rates with modern growth rates (Hoppa, 1992; Saunders, Hoppa, and Southern, 1993). This produces skeletal growth profiles (SGPs) that indicate that children from ancient populations were smaller than their modern counterparts beginning around the first year of age (Hoppa, 1992). For this dissertation, femoral diaphyseal lengths are plotted against dental age estimations (Ubelaker, 1978).

Maximum long bone lengths of femora and tibiae are recorded for adults and subadults. In subadults, the maximum length of the diaphyses (without epiphyses attached) of the femora and tibiae are recorded. The lengths of adult male and female femora and tibiae are compared between temporal periods and between Butt Road and Cirencester and London. The diaphyseal lengths of subadults are plotted against dental age estimates and compared with Cirencester and London as well.

Spatial Data

The site report for the Butt Road cemetery includes detailed plans of the cemetery for each temporal phase and plans of each burial (Crummy et al., 1993). In addition, the site report provides data on grave orientation, body position, coffin type, presence and type of grave goods, and grave location within the cemetery. The original site plans for Period 1 and Period 2 are converted into shape files in ArcGIS and geo-referenced using the building foundations visible from current aerial photographs.

Treatment of Comingled Burials

Six graves contained commingled skeletons (Table 1). These skeletons were assigned the same grave number and then assigned a letter (A or B) to distinguish between individuals within the same grave. These skeletons were assigned new numbers to be compatible with statistical software programs and ArcGIS, so that skeleton 33A became 3301 and 33B became 3302. The table below lists all of the graves that were renumbered to accommodate ArcGIS. In order for each of these individuals to still be linked to their grave on the map, the original grave is divided in two and relabeled to match the skeleton number. This allows skeletons from comingled graves to still be included in the spatial analysis. The database of skeletal and mortuary data was joined to the maps of Period 1 and Period 2 graves. This allows for the creation of new maps displaying the distribution of individuals by sex, age, pathologies, and grave goods.

Table 1: Skeletal Numbers for Comingled Burials

Original Grave Reference	**Grave Reference in ArcGIS**
121A	1211
121B	1212
33 MNI=2	3301 3302
41A	4101
41B	4102
569 MNI=2	5691 5692
693A	6931
693B	6932
694A	6941
694B	6942

Statistical Analysis

The statistical software program SPSS and Vassar Stats Research Calculator Number Three are used to calculate the statistical tests used in this study with the exception of cluster analysis (http://faculty.vassar.edu/lowry/VassarStats.html). High/Low (Getis Ord G) cluster analysis is calculated using the statistical toolbox available in ArcGIS 9.4

Physiological Stress Indicators

Descriptive statistics are calculated for all physiological stress data collected (Coolidge, 2000). The prevalence of LEHs are calculated at the individual level and based on tooth number using the Universal System for adult dentition (Buikstra and Ubelaker, 1994). Prevalence rates for cribra orbitalia, maxillary sinusitis and periostitis are based on the number of necessary elements affected divided by the number of necessary elements available for scoring. Pearson's Chi Square and Fisher's Exact Test are used to identify significant differences in the prevalence of stress indicators between subsets of the sample. Long bone length has a strong correlation to stature. Increases or decreases in long bone length may reflect changes in population health and nutrition over time (Steckel et al., 2006). Differences in long-bone length of adults are compared using t-tests and Mann-Whitney U tests.

Spatial Analysis

Few Roman period cemeteries have been analyzed using spatial methods. Spatial analysis is included in this dissertation for several reasons. Status within society has the potential to impact an individual's health through differential access to resources. By studying the distribution of health indicators within a cemetery, it may be possible to identify different status groups within the sample. The distribution of individuals by age and sex can be an important indicator of status and social perceptions. For example, in the Roman period Yasmina cemetery of Carthage, young children and infants were buried in one section of the cemetery separate from adults and older children (Norman, 2002 and 2003).

In addition, this dissertation is focused on the possible relationship between health and the conversion to Christianity within the Roman Empire. Studying the organization of the cemetery provides insight into other aspects of local organization and identity.

Spatial analysis of the Butt Road cemetery is built upon Goldstein's (1981) work for organized cemeteries. The analysis begins with a simple visual inspection of the plans from the Butt Road cemetery based on grave orientation, groupings, changes in coffin type, and the inclusion of grave goods (Goldstein, 1981).

The cemetery is divided into four areas labeled A, B, C, and D based on what appear to be fairly linear gaps between graves. By dividing the cemetery into these areas, it is easier to describe differences within the cemetery. In the Butt Road sample, a "cluster" is defined as a group of three or more graves that are in close proximity. ArcGIS is used for much of the spatial analysis of the cemetery (Ormsby et al, 2004).

High/Low Clustering (Getis-Ord General G) spatial statistics are used to explore the intensity of spatial relationships between features. High/Low clustering explores the relationships between values within space and measures the intensity of clusters. High/Low clustering calculates the General G statistic and associated z score for a given input feature class. A positive z score indicates high values cluster while a negative z score indicates low values are clustering. A z score near 0 indicates no clustering or that any apparent clusters are random/due to chance (ArcGIS 9.2 Webhelp topic).

Regional Comparisons

The results of the skeletal analysis of the Butt Road cemetery is compared with published data available from several other Romano-British cemeteries. The site report from the Bath Gate Cemetery from Cirencester, including the human bone report by Dr. Calvin Wells, provides skeletal data regarding age, sex, pathologies, and long bone lengths (McWhirr, 1982). Skeletal data are available online from the London Roman period cemeteries through the Centre for Bioarchaeology at the Museum of London.

Bath Gate Cemetery, Cirencester

The Bath Gate Cemetery in Cirencester UK was excavated from 1969-1976. Dr. Calvin Wells inventoried and analyzed the human skeletal material recovered from the cemetery prior to his death in 1978. He contributed a chapter to McWhirr (1982) in which he summarized his demographic and paleopathology findings. The chapter primarily focuses on the trauma and osteoarthritis present in the skeletal collection. Cribra orbitalia, periostitis, and linear enamel hypoplasias are reported briefly but the number of individuals observable for periostitis and LEHs are not included in the chapter.

The site report includes chapters that summarize the site, the human skeletons, and the small finds, but a majority of the in-depth data was published on microfiche. Dr. Calvin Wells' notes were compiled into several sections on microfiche included with the McWhir (1982) volume. These included tables of skull and long bone measurements and the anatomical details for the burials, including descriptions of pathologies and trauma. Data from the microfiche, including long bone lengths and dental inventories, is compiled into a database for the present study. However, when compared with Wells' chapter in the McWhir volume (1982), there are discrepancies in the number of pathologies listed in the notes versus in the chapter. It seems likely that not all of Wells' notes were converted into microfiche, or perhaps he reanalyzed skeletons, but the new notes were not included in the microfiche.

Previous comparisons of the Bath Gate cemetery with other Romano-British sites have relied on the frequencies given in the site report chapter (Wells, 1982). In order to make this dissertation comparable to previous studies; it primarily makes use of the frequencies provided by Wells chapter in McWhir's 1982 volume. In some instances the data from the notes is used to develop a better idea of preservation and observable elements, as this information is not available in the site report.

Roman South and Roman West, London

The Museum of London's Centre for Human Bioarchaeology provides online databases for all of the skeletal collections at the centre. This includes two Roman collections, Roman West and Roman South. The codebook used by the Centre was downloaded August 5, 2010. Each collection has databases for age estimates, sex estimates, dental pathologies (including linear enamel hypoplasias), skeletal pathologies, metrics, and diaphyseal lengths. The team of osteologists at the Centre collected the data and the databases are updated as needed. In order to maintain consistency, the data from Roman West and Roman South are recoded to match the categories used in this study where necessary and possible.

Summary of Materials and Methods

This chapter presents the sampling strategy and the skeletal variables used in this study. The Butt Road cemetery appears to have to distinct temporal periods. All of Period 1 is included in this study. Due to the size of the Period 2 sample, a stratified proportional random sample with a sampling fraction at or above 20% is used to study skeletal stress and mortuary treatment in Period 2. All individuals included in this study are inventoried and reassessed for sex and age. Multiple skeletal stress indicators are used to assess biocultural stress in this sample including: linear enamel hypoplasias, cribra orbitalia, periostitis, maxillary sinusitis, and maximum long bone length. The site report by Crummy et al. (1993) provides data on mortuary treatment including grave orientation and grave good presence and type.

Two skeletal samples from London, Roman South and Roman West, and the Bath Gate Cemetery skeletal sample from Cirencester are used to develop a regional perspective of skeletal stress. The skeletal data for the regional comparison of biocultural stress comes from the Museum of London’s Centre for Human Bioarchaeology and *Cirencester Excavations 2: Romano-British Cemeteries at Cirencester* by McWhir et al. (1982).

The skeletal and mortuary data from the Butt Road cemetery are combined into a database linked to ArcGIS to study the spatial distribution of these skeletal indicators. SPSS is also used to calculate statistical tests used in this study. The sample of human skeletons from the Butt Road cemetery described in this chapter will be used to address research questions one, two, and three described in Chapter Two. The results of these questions will be presented in Chapters Four and Five. The results of the inter-site analysis will be presented in Chapter Seven.

Chapter 4 Results of the Skeletal Analysis of the Butt Road Cemetery

Introduction

This chapter discusses the results of the skeletal analysis of the Butt Road Cemetery skeletal sample. Due to the size of the Butt Road cemetery, the entire skeletal collection is not used for this dissertation. Instead a sampling strategy (discussed in Chapter Three) is used to select a subset of the entire collection that addresses the research questions related to skeletal stress and spatial distribution within the cemetery. The sample draws on individuals from both temporal phases and all areas of the cemetery. Skeletal health studies normally focus on individuals for which age and sex can be determined. The sampling strategy used here attempts to do that by sampling from graves previously identified as male, female, and subadult.

Upon re-examination of the skeletal material, there are occasionally discrepancies between the human bone report by Pinter-Bellows (1993) and the analysis for this study. As mentioned in Chapter Three, there are 28 graves that are reclassified after this analysis. The skeletons from the graves are fragmentary and the cortical bone surface is often very poor making it difficult to age and sex these individuals. However, two individuals were originally sexed male but are reclassified as females based on pelvic and cranial morphology. Several individuals previously assigned a sex are classified as sex unknown adults in this study. The ages of one extremely fragmentary individual is adjusted from a ten year-old subadult to an adult based the thickness of cortical bone of a femoral fragment.

A total of 180 skeletons from the Butt Road Cemetery are included in the sample for this dissertation. This sample is further broken down into two temporal periods. Period 1 spans the 1st-3rd centuries AD. This includes 61 excavated graves but skeletal material was only recovered from 46 of these graves. All skeletal material from Period 1 is included in this study. Preservation of Period 1 skeletons is generally very poor as many of these graves had been disturbed by Period 2 graves.

Period 2 of the cemetery is larger and generally better preserved than Period 1. Stratified random sampling is used to select the sample for Period 2 (See Chapter Three). Table 2 displays the total sample from the Butt Road cemetery. Subadults comprise 31% of the sample. Female adults represent 23% of the sample. Male adults represent 28% of the sample. Ambiguous individuals (8%) and Unknown Adults (8%) are also included in the sample. Ambiguous individuals displayed both female and male characteristics as opposed to Unknown adults, which had insufficient evidence or preservation to determine sex. Probable females and males are combined with females and males respectively in order to increase cell size for this analysis.

Table 2: Butt Road Cemetery Sample

	Period 1	**Period 2**	**Total Sample**	***Frequency %***
Subadults	12	44	56	*31*
Females	2	16	18	*10*
Probable Females	4	20	24	*13*
Ambiguous	10	5	15	*8*
Males	6	18	24	*13*
Probable Males	5	23	28	*16*
Unknown Adults	7	8	15	*8*
Total	46	134	180	*100*

The following indicators of stress are used in this analysis: linear enamel hypoplasias (LEH), cribra orbitalia, periostitis, maxillary sinusitis, specific infections, and long bone metrics. These indicators are recorded for adult and subadult samples. Differences based on age, sex, and temporal period are discussed. The demography of the total sample and each temporal period will be presented first.

Population Demographics for Butt Road Cemetery

Subadult Demography

Subadults are divided into four age categories. The subadult age groups used in this study are based on the categories used by the Museum of London's Centre for Bioarchaeology. The reason for this is that two of the comparative samples, Roman South and Roman West, were analyzed and coded based on these divisions (Connell and Rauxloh, 2003). However, this study places all infants (less than one year) into one cohort, while the code system for the museum of London subdivides infants into 1-6 months and 7-11 months (Connell and Rauxloh, 2003). The categories used in this study are as follows:

Infant (less than 1 year)
Early childhood (2-5 years)
Late childhood (6-11 years)
Adolescence (12-17 years)

Table 3 below shows the number of subadults in each age category. In Period 1 there are two subadults that cannot be assigned to specific age categories due to poor preservation.

Table 3: Subadult Age Demographics

Age	**Period 1**	**Period 2**	**Total Subadults**	**% Total Subadults**
Infant	0	5	5	*8.7*
2-5 years	3	15	18	*31.6*
6-11 years	2	17	19	*33.3*
12-17 years	5	8	13	*22.8*
Subadult Only	2	0	2	*3.5*
Total	12	45	57	*100.0*

Adult Demography

Age is reassessed for all individuals included in the sample. The adult age categories used in this study are also based on the age categories in Connell and Rauxloh's "A Rapid Method for Recording Human Skeletal Data" (2003) used by the Museum of London's Centre for

Bioarchaeology. However, Connell and Rauxloh divide their Middle Aged Adults into Middle Adult A (26-35 years) and Middle Adult B 36-45 years. These middle age categories begin at 26 years in contrast to the middle age category in Standards that begins at 35 years (Buikstra and Ubelaker, 1994).

The breakdown of adult age groups used in this sample is a better representation for life expectancies during the Roman period. A tax table by Ulpian from the 3rd century AD suggests that life expectancy was quite low in the Roman period (Frier, 2010). Life expectancy at birth was only 21 years and if a child survived to age 10 years, life expectancy rose to 45 years (Frier, 2010:88). Some individuals did live into old age but census records suggest that living passed 70 years was quite rare (Frier, 2010). The age at which individuals were recognized as adults was also much younger in Roman society. Women could marry at age 12 and men at 14 years (Frier, 2010). Men were also taxed beginning at age 14 (Frier, 2010). This means that most Romans were functioning as adults within society well before becoming biologically mature. This may have important implications for skeletal stress within this sample.

One of the goals of this dissertation is to develop a regional perspective of skeletal stress in Roman Britain by comparing the results of this analysis to other Romano-British cemetery samples from London and Cirencester. The age categories used in this study are comparable with the age codes used for the comparative samples from London. The categories used for adults are:

Young Adult (18-25 years)
Middle Aged Adult (26-45 Years)
Old Adult (46+ years)

Table 4: Adult Age and Sex Demographics

Sex and Age		Period 1	Period 2	Total	
Female	Young	3	5	8	41
	Middle	1	17	18	
	Old	0	2	2	
	Adult	2	11	13	
Male	Young	4	1	5	52
	Middle	5	22	27	
	Old	1	4	5	
	Adult	1	14	15	
Ambiguous	Middle	2	3	5	15
	Adult	8	2	10	
Unknown	Young	0	1	1	15
	Adult	7	7	14	
Total		34	89	123	

Sex

Biological sex is also reassessed for all individuals included in the sample. Sex is based on morphology of the pelvis and skull (See Chapter Three). While the pubic bone is often not well preserved, the ilium and ischium, including the greater sciatic notch, arc composé, and pre-auricular sulcus are more likely to be observable in this sample. In the cranium, glabella, the supraorbital margins, mastoid processes, and nuchal line are used to assess sex. The mandible is also assessed if available and sufficiently preserved. The categories for sex are: female, probable female, ambiguous, male, and probable male. Ambiguous sex refers to individuals that display both male and female characteristics. Unknown Adults refers to individuals that did not have sufficient skeletal evidence to determine sex because neither the pelvis nor the skull are available or preserved for assessment. Table 4 summarizes adult age and sex distribution for this sample.

Skeletal Preservation

Preservation plays a major role in what can be said about skeletal health. During the inventory and analysis phase of the project, the completeness of the skeleton is evaluated and categorized based on the following: skull/teeth only, skull/teeth + thorax/upper limbs, complete skeleton, post-crania only, legs only, very fragmentary limbs only, very fragmentary skull and post-crania, and no skeletal remains recovered. Fragmentary skeletons are most frequently observed at 38% of the sample followed by complete skeletons at 23%. Table 5 below summarizes the preservation of the sample.

Table 5: Preservation of the Skeletal Sample

Completeness of Skeleton	**Period 1**	**Period 2**	**Total**	**Frequency %**
Skull/teeth only	8	12	20	9
Skull+Thorax	2	5	7	3
Complete Skeleton	0	49	49	23
Post Crania only	1	4	5	2
Lower Limb only	0	3	3	1
Very fragmentary post crania	13	6	19	9
Fragmentary skeletons	23	58	81	38
No skeletal remains recovered	13	16	29	14
Total	60	153	213	100

Erosion of the cortical surface of skeletal elements affects the ability to observe some skeletal stress indicators. Many individuals have poor cortical surfaces on long bones and the cranial vault making it difficult to observe pathologies such as periostitis and porotic hyperostosis (which was excluded from the analysis for this reason). However, most complete skeletons are in good condition and dental preservation is quite good.

Preservation is affected by location within the cemetery. The density of graves impacts preservation because earlier graves (including most of Period 1 and some Period 2 graves) were disturbed by later graves. Some of these disturbances led to the comingling of two individuals within the same grave or for individual skeletal elements to become dissociated with the rest of the skeleton. For example, Grave 651 contained the left and right clavicles from a probable female skeleton and an additional right clavicle. Although it is noted that Grave 651 has a minimum number of individuals (MNI) of two, for the purposes of this study the right clavicle is not included in the sample as an individual. Only semi-complete (crania and post-crania present) comingled burials for which age and sex can be determined are include in this sample based on the sampling strategy discussed in Chapter Three.

Variation of soil and other taphonomic factors within the cemetery area also appears to affect preservation. Skeletons from the edges of the cemetery are generally poorly preserved while skeletons from the central areas of the cemetery are in better condition. The relationship between preservation and location within the cemetery will be discussed further in Chapter Five Mortuary Analysis Results.

The next section will summarize the results of each indicator of skeletal stress. The frequencies of each indicator are based on the number of individuals with the skeletal stress indicator present divided by the number of individuals with sufficient preservation for the indicator to be observed.

Results of Skeletal Stress Indicators

The skeletal stress indicators used in this study can be divided into two categories: indications of disruption in growth or development and non-specific infections. Linear enamel hypoplasias (LEH), cribra orbitalia, and long bone lengths reflect disruptions in growth or development, often related to periods of dietary insufficiencies. Non-specific infections, such as periostitis or maxillary sinusitis are often the result of local or systemic infections.

Disruptions in Growth and Development

Linear Enamel Hypoplasias

Individuals are included in the analysis of linear enamel hypoplasias if they have at least one anterior tooth present and do not have excessive dental wear. A total of 107 individuals have observable anterior teeth. There are 42 (39%) individuals with at least one visible LEH. In Period 1, 21 individuals have observable teeth and 11(52.4%) have LEHs. This can be broken down into 40% of females (2/5), 43% of males (3/7), 50% of ambiguous adults (1/2), and 71% subadults (5/7).

In Period 2, there are 82 individuals with observable anterior teeth and 31 have at least one LEH (37.8%). This can be broken down into 30% of females (9/30), 30% of males (11/33), and 58% of subadults (11/19). The tables below summarize the presence and absence of LEHs in the sample.

Table 6: LEHs in the Butt Road Sample

LEHs	Present	Absent	Total	Frequency %
Adults	26	51	77	33.8
Subadults	16	10	26	62

Table 7: LEHs in Period 1

LEHs	Present	Absent	Total	Frequency %
Adults	6	8	14	42.9
Subadults	5	2	7	71

Table 8: LEHs in Period 2

LEHs	Present	Absent	Total	Frequency %
Adults	20	43	63	31.7
Subadults	11	8	19	58

Cribra Orbitalia

Cribra orbitalia is observed on the roof of the eye orbits on the frontal bone. A total of 115 individuals have at least one observable eye orbit. Of these, 23 (20%) have evidence for cribra orbitalia. The tables below summarize the presence and absence of cribra orbitalia for adults and subadults in each temporal phase.

Period 1

The frequency of cribra orbitalia for the Period 1 sample is 12% (2 present/17observable). Although there are five females, six males, and three subadults in Period 1 that have intact orbits, none are affected by cribra orbitalia. Three ambiguous skeletons have intact orbits and two of these individuals have cribra orbitalia.

Period 2

The frequency for the Period 2 sample is 21.6% (21 affected individuals /97 observable individuals). When broken down by demographic group, cribra orbitalia is present in 10% of females (3/30), 9% males (3/33), 50% of ambiguous individuals (1/2), and 44% of subadults (14/32).

Table 9: Cribra Orbitalia in the Butt Road sample

Cribra Orbitalia	**Present**	**Absent**	**Total**	**Frequency %**
Adults	9	70	79	11.4
Subadults	14	21	35	40

Table10: Cribra Orbitalia in Period 1

Cribra Orbitalia	**Present**	**Absent**	**Total**	**Frequency %**
Adults	2	12	14	14.3
Subadults	0	3	3	0

Table 11: Cribra Orbitalia in Period 2

Cribra Orbitalia	Present	Absent	Total	Frequency %
Adults	7	59	66	10.6
Subadults	14	18	32	44

Long Bone Lengths

The maximum length of femora and tibiae are recorded if possible. Preservation impacts how many individuals have measureable bones; often either the proximal or distal ends are broken or too damaged to measure. Unfortunately, some individual's long bones were lost during a DNA research project (Personal communication with Paul Sealey). However, 42 individuals in this sample have femora that can be measured.

Period 1

Period 1 is generally poorly preserved but there are seven males with intact femora. There is only one female in Period 1 with an intact femur. It is also the longest of all the female femora at 433mm.   There are 6 males and 2 females with at least one intact tibia in Period 1. The table below summarizes the results of maximum length of femora and tibiae for Period 1 males and females.

Table 12: Adult Femora Lengths Period 1 (in mm)

Sex	Number	Minimum	Maximum	Mean	Standard Dev. (mm)
Male	7	396.0	477.0	436.6	27.5
Female	1	433.0	433.0	433.0	

Table 13: Adult Tibiae Lengths in Period 1 (in mm)

Sex	Number	Minimum	Maximum	Mean	Standard Deviation (mm)
Male	6	301	393	349.8	31.6
Female	2	337	350	343.5	9.2

Period 2

In Period 2, there are 20 males and 11 females with intact femora. There are 19 males and 8 females with at least one intact tibiae. The table below summarizes the maximum length of femora and tibiae for males and females in Period 2.

Table 14: Adult Femora Length in Period 2 (in mm)

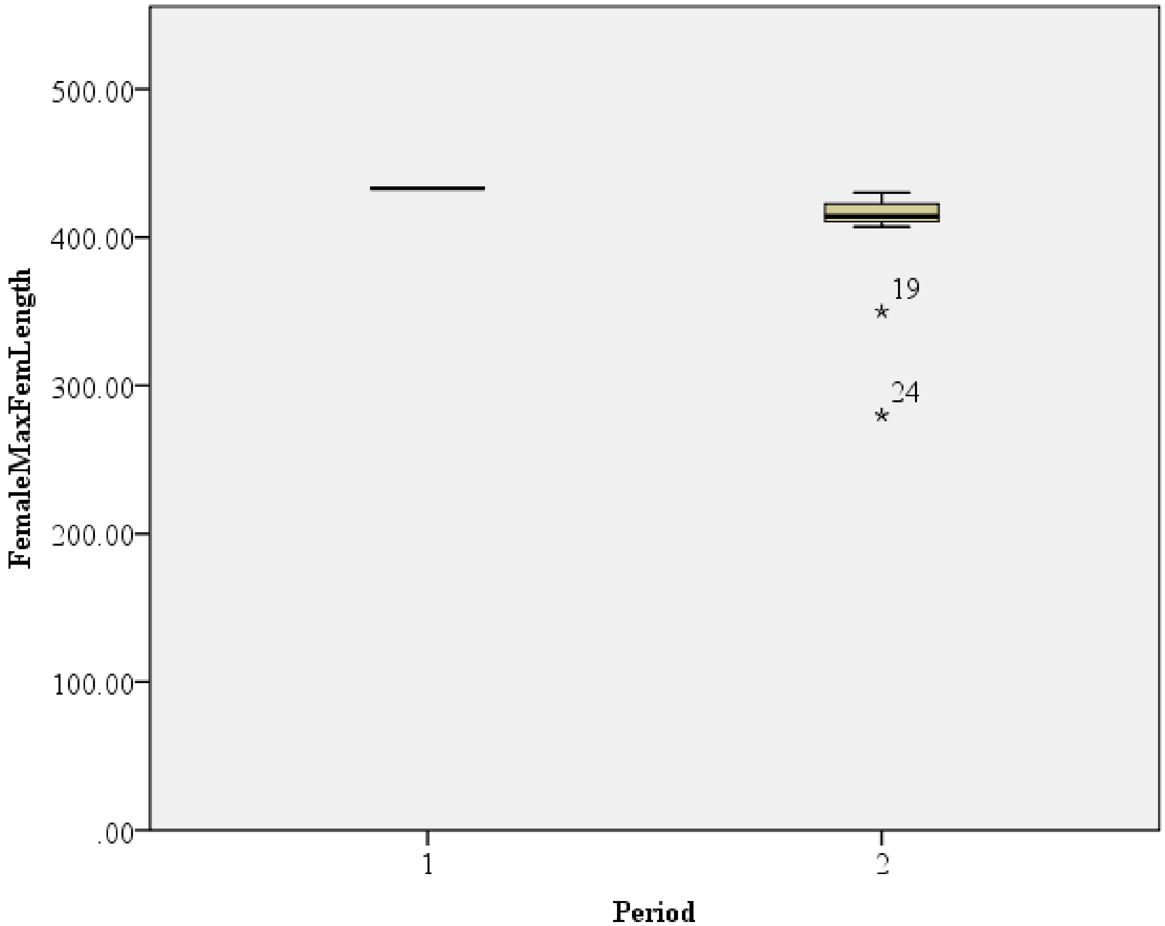
Sex	Number	Minimum	Maximum	Mean	Standard Dev.
Male	20	405.0	476.0	441.8	22.8
Female	11	280.0	430.0	400.0	45.3

Table 15: Adult Tibiae Length in Period 2 (in mm)

Sex	Number	Minimum	Maximum	Mean	Standard Dev.
Male	19	316.0	415.0	363.2	27.8
Female	8	286.0	360.0	321.9	21.2

Independent Samples t-tests and Mann Whitney U tests are used to compare the femora and tibiae lengths for males ($p=0.62$) and females ($p=0.50$) between Period 1 and Period 2. There are no significant differences at the $p=0.05$ level in long bone length between Period 1 and Period 2 for either sex using independent t-tests or Mann Whitney U tests.

Figure 2: Boxplot[1] of Female Maximum Femur Lengths (Butt Road)



[1]The top and bottom of the tan boxes represent the upper and lower quartiles while the thick black line represents the median. The whiskers represent the highest and lowest values that are not extreme values. The stars represent outliers.

Figure 3: Boxplot of Male Maximum Femur Lengths (Butt Road)

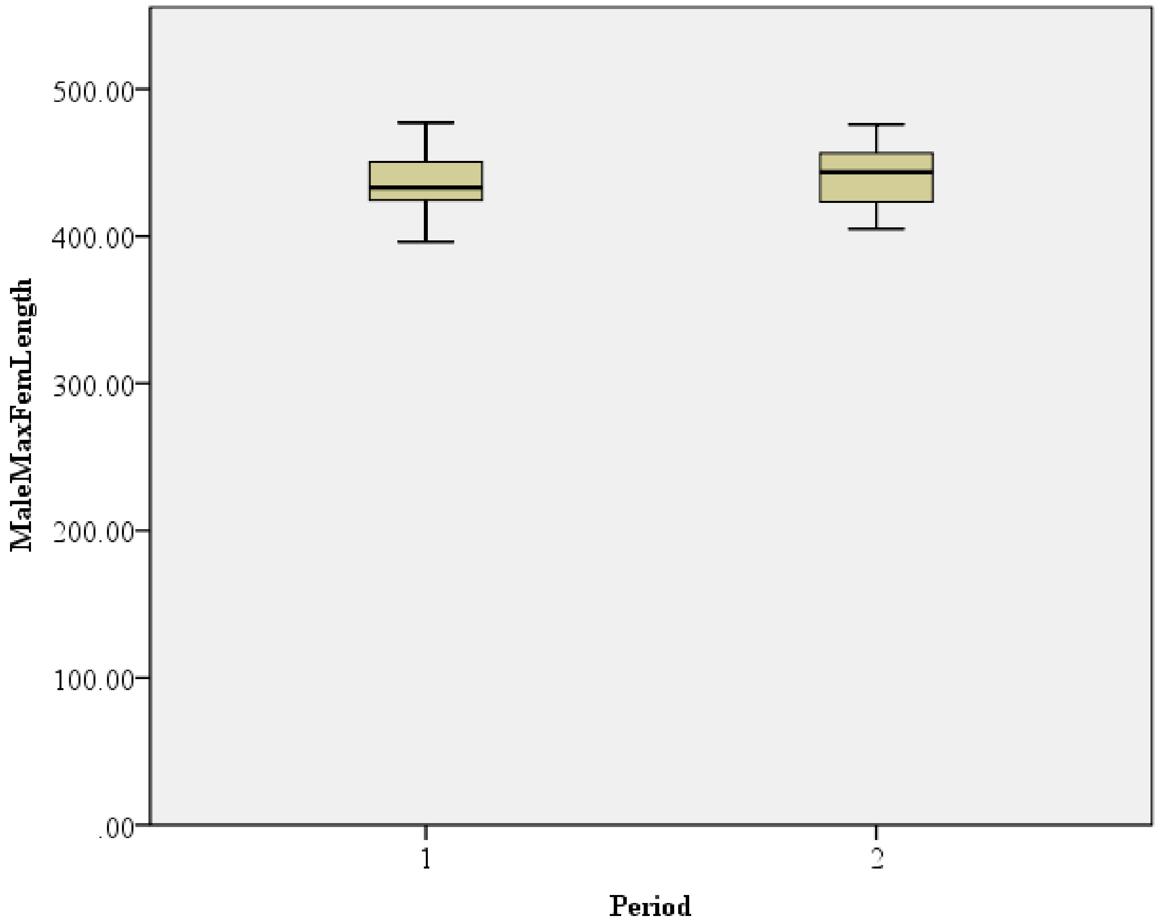


Figure 4: Boxplot of Female Maximum Tibia Lengths (Butt Road)

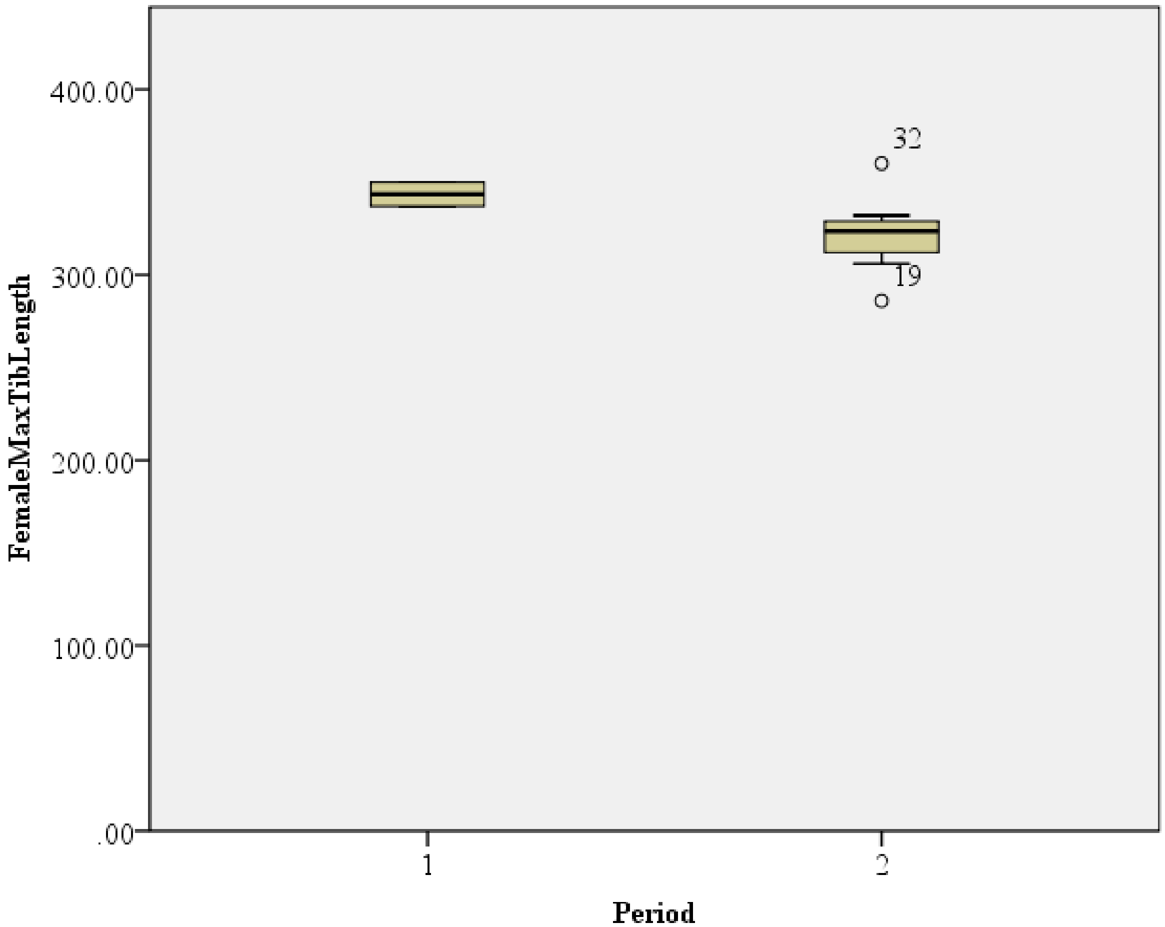
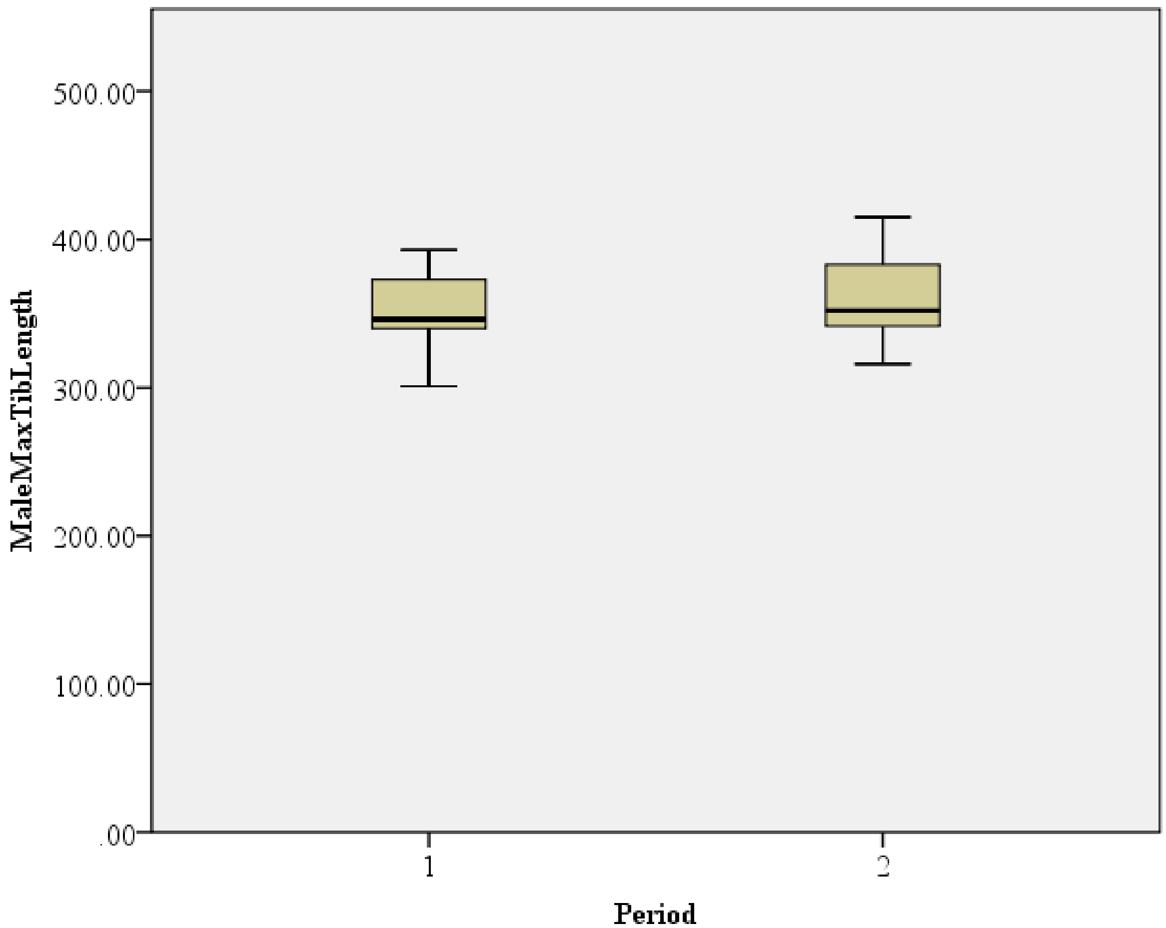


Figure 5: Boxplot of Male Maximum Tibia Lengths in Period 1 and Period 2

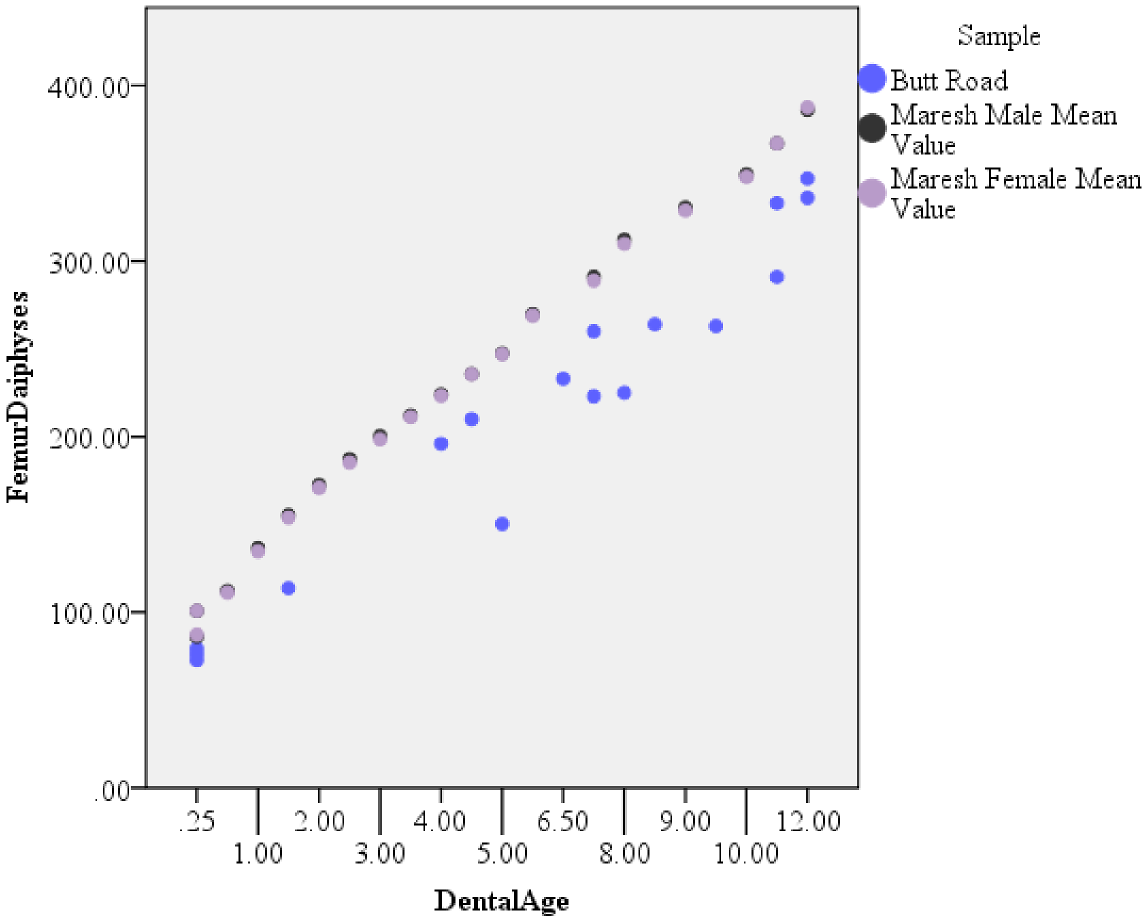


Subadult Diaphyses

There are a total of 19 subadults with measureable femoral diaphyses. However two individuals consist of post-crania only, so dental age estimates are only available for 17 individuals. Only two of the 12 subadults from Period 1 have femoral diaphyses that can be measured. In Period 2, 17 subadults have intact femoral diaphyses. This can be broken down to: five infants, four in early childhood (2-5 years), seven in late childhood (6-11 years), and three adolescents (12-17 years). Figure 6 places femoral diaphyseal length against dental age estimate for 17 subadults in the Butt Road sample.

Schaefer et al. (2009) provides the means of femoral diaphyseal lengths for males and females from 1.5 months to 12 years based on Maresh (1970). The mean diaphyseal length for males (red) and females (green) at each age are also plotted on the graph below. The Butt Road sample (blue) falls below both males and females in the Maresh (1970) sample. This is expected based on previous studies comparing modern and archaeological subadult samples (Hoppa, 1992). Although the Butt Road sample is small, there does seem to be some range in the length of femoral diaphyses within each dental age. A comparison between the diaphyseal length and dental age between comparative samples will be discussed in Chapter Six.

Figure 6: Subadult Diaphyseal Length vs. Dental Age Estimate (Butt Road)[1]



[1]Dental Age= 0.25 birth – 3 months, .5 = 3-6 months, 0.75= 6-9 months, 1=9months-1year, 2-2 years, 3=3 years, 4=4 years etc.

Nonspecific Infection

Periostitis

The frequency of periostitis for the entire sample is 14% (16 affected individuals /114 observable individuals). The tables below summarize the presence and absence of periostitis in the sample.

Period 1

The small size of Period 1 and the heavy erosion on the cortical surface of the Period 1 skeletal material makes it difficult to accurately observe periosteal reaction. Only four females have observable long bones and none are affected by periostitis. Ten males have observable long bones but none are affected. Six subadults have observable long bones and none are affected. Seven ambiguous adults have observable long bones and one is affected by periostitis. In summary, only one case of periostitis is observed in the Period 1 sample (1/27).

Period 2

The preservation of the cortical surface is still an issue in Period 2, but in general the skeletal material from Period 2 is in better condition than the Period 1 skeletal material. The frequency of periostitis of the tibia for Period 2 sample is 17% (15 affected individuals /87 observable individuals). Periostitis affected 9.5% of females (2/21), 34% of males (11/32), 33% of ambiguous individuals (1/3), and 3% of subadults (1/31). Tables of the numbers of present, absent, and total individuals observed for each demographic group are available in the appendix.

Table 16: Periostitis in the Butt Road sample

Periostitis	**Present**	**Absent**	**Total**	**Frequency %**
Adults	15	62	77	19.5
Subadults	1	36	37	2

Table 17: Periostitis in Period 1

Periostitis	**Present**	**Absent**	**Total**	**Frequency %**
Adults	1	20	21	4.8
Subadults	0	6	6	0

Table 18: Periostitis in Period 2

Periostitis	**Present**	**Absent**	**Total**	**Frequency %**
Adults	14	42	56	25
Subadults	1	30	31	3

Periostitis most frequently affects the tibiae (13 affected /16 observable tibia), followed by the femur, and the fibula. Four individuals have evidence for periostitis on multiple bones.

Grave 35, a middle aged male, has the most severe case of periostitis in the entire sample. All of this individual's long bones, including phalanges, are affected by periosteal reaction.

Maxillary Sinusitis

A total of 80 maxillary sinuses are available for inspection in this sample. Some type of bony reaction affects 30 (37.5%) of these sinuses. The tables below summarize the presence and absence of maxillary sinusitis in the sample.

Period 1

The number of observable sinuses in Period 1 is relatively small but many of these sinuses are affected by bony reaction. There are 18 maxillary sinuses available for inspection and 6 (33%) are affected by bony reaction. Evidence of sinusitis is present in 50% of females (2/4), 37.5% of males (3/8), 33% of ambiguous individuals (1/3) and 0% of subadults (0/3). Tables of the numbers of present, absent, and total individuals observed for each demographic group are available in the appendix.

Period 2

In Period 2, 62 maxillary sinuses are available for inspection and 24 (38.7%) are have bony changes present. Sinusitis affects 50% of females (10/20), 48% of males (11/23), 0 ambiguous individuals (0/2) and 18% of subadults (3/17). It should be mentioned that it is difficult to distinguish sinusitis in subadults from developmental processes associated with the development and eruption of the dentition. However, the three subadults with bony reaction are similar to what is observed in adults (pitting, spicules, porosity) so it seems likely that these three individuals exhibit signs of a pathological reaction and not developmental processes.

Table 19: Maxillary Sinusitis in the Butt Road Sample

Sinusitis	**Present**	**Absent**	**Total**	**Frequency %**
Adults	27	33	60	45
Subadults	3	17	20	15

Table 20: Maxillary Sinusitis in Period 1

Sinusitis	Present	Absent	Total	Frequency %
Adults	6	9	15	40
Subadults	0	3	3	0

Table 21: Maxillary Sinusitis in Period 2

Sinusitis	Present	Absent	Total	Frequency %
Adults	21	24	45	46.7
Subadults	3	14	17	18

Specific Infections

No indicators of infectious disease are observed in this sample. While not an infectious disease, gout is reported in Roman populations and at least one individual from Colchester seems to have suffered from gout (Roberts and Cox, 2003). During the Roman period, indicators of specific infectious disease are not widely reported but do occur occasionally. These include indicators of tuberculosis, brucellosis, and leprosy (Capasso, 1999; Roberts and Cox, 2003). The next section uses the results of the skeletal stress indicators previously discussed to address the hypotheses and research questions presented in Chapter Two.

Results of Hypotheses for Skeletal Health

Period 1 vs. Period 2

Research question 1: Do the prevalence of skeletal stress indicators differ significantly between temporal periods?

Hypothesis 1a: The Period 1 sample will have higher levels of skeletal stress indicators then Period 2 sample.

As discussed in Chapter Two, there are a number of factors that could contribute to changes in population health in the 4th century. Many factors can impact population health, including urban development, environmental factors, and economic and political changes in the Empire (Dark, 1994). In the case of Britain, conquest and urban development under Roman rule continued well into the 2nd century AD potentially making it difficult for populations to deal with their environment and creating new cultural stressors. Also, religious change in the 4th century may have created a new means to buffer cultural and environmental stress. Historians have suggested that Christian missionary efforts could improve population health (Avalos, 1999). The combination of these factors may results in differences in skeletal stress between Period 1 and Period 2 of the Butt Road cemetery. It is hypothesized that Period 1 experienced higher levels of physiological stress than Period 2. However, the results of this study do not support this hypothesis. Instead, there appears to be very little difference in skeletal stress between Period 1 and Period 2.

Pearson's Chi Square and Fisher's Exact Test are used to for significance at the $p = 0.05$ level in skeletal stress between Period 1 and Period 2. SPSS and Vassar Stats are used to calculate Pearson's Chi Square and Fisher's Exact Test. Due to small cell size, it is not possible to calculate Pearson's Chi Square for some of the comparisons. When cell size is below 5, Fisher's Exact Probability Test is used to compare Period 1 to Period 2.

As previously discussed, the poor preservation of the Period 1 sample makes it difficult to observe skeletal stress indicators and this likely contributes to the results of this comparison. However, results indicate that there is little difference in skeletal stress between the two temporal periods. There is not a significant difference in the amounts of cribra orbitalia, LEHs, and maxillary sinusitis between Period 1 and Period 2 in adult males, females, and subadults. There is a significant difference in periostitis between Period 1 and Period 2 samples at the $p = 0.1$ level. The Period 2 sample has more individuals with periostitis but this is likely due to preservation issues in the Period 1 sample.

When age groups of adults are compared, the only significant difference between young adults from the two time periods is periostitis (p=0.045). There are no significant differences in the presence of the other health indicators between young adults in Period 1 and Period 2 (cribra orbitalia p=1, LEHs p.0.59, sinusitis, p=1). There are no significant differences between health indicators between middle age adults in Period 1 and Period 2 (cribra orbitalia p=1, periostitis p=0.31, LEHs p=1, sinusitis p=0.38). Old adults cannot be compared; there is only one old adult in Period 1. There are no significant differences between health indicators in unclassified adults (cribra orbitalia p=0.15, periostitis p=0.59, LEHs p=1, and sinusitis p=0.47). Due to the small sample size of Period 1, it is not possible to compare males and females between time periods by age group. The tables and graphs summarize the frequency of skeletal health indicators for females, males, and subadults in Period 1 and Period 2.

Table 22: Skeletal Indicators of Stress in Period 1 Females

Pathology	**Present**	**Absent**	**Total Number**	**Frequency**
LEH	2	3	4	*40*
Cribra Orbitalia	0	5	5	*0*
Periostitis	0	4	4	*0*
Sinusitis	2	2	4	*50*

Table 23: Skeletal Indicators of Stress in Period 2 Females

Pathology	**Present**	**Absent**	**Total Number**	**Frequency**
LEH	9	21	30	*30*
Cribra Orbitalia	3	27	30	*10*
Periostitis	2	19	21	*9.5*
Sinusitis	10	10	20	*50*

Figure 7: Frequency of Skeletal Stress Indicators in Females (Butt Road)

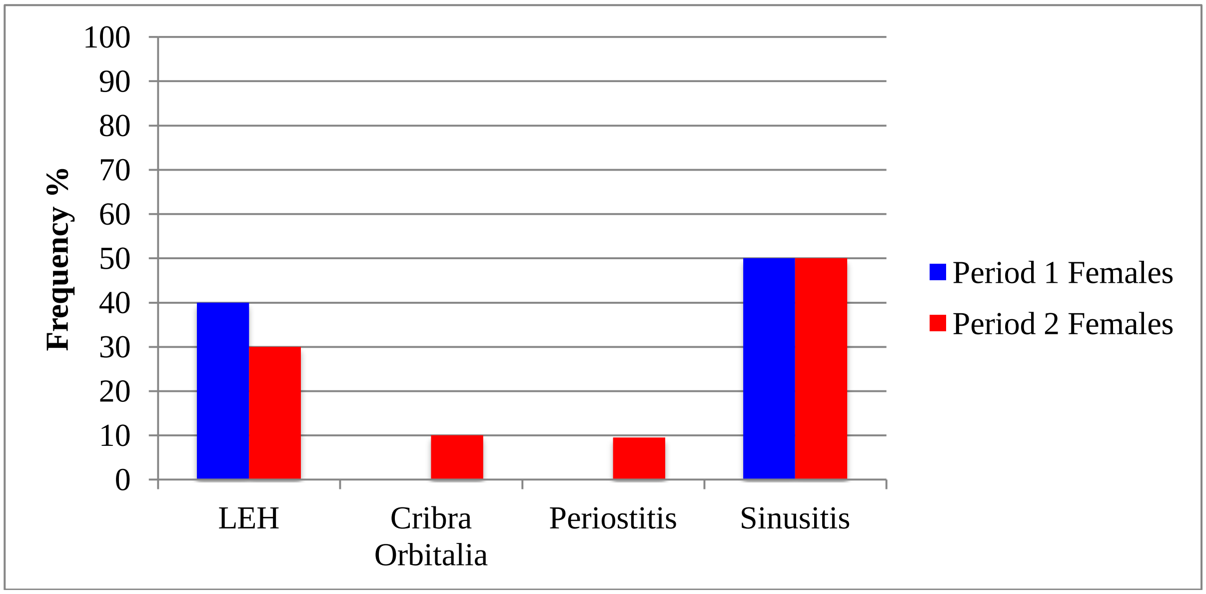


Table 24: Skeletal Indicators of Stress in Period 1 Males

Pathology	**Present**	**Absent**	**Total Number**	**Frequency**
LEH	3	4	7	*43*
Cribra Orbitalia	0	6	6	*0*
Periostitis	0	10	10	*0*
Sinusitis	3	5	8	*37.5*

Table 25: Skeletal Indicators of Stress in Period 2 Males

Pathology	**Present**	**Absent**	**Total Number**	**Frequency**
LEH	11	22	33	*30*
Cribra Orbitalia	3	30	33	*9*
Periostitis	11	21	32	*34*
Sinusitis	11	12	23	*48*

Figure 8: Frequency of Skeletal Stress Indicators in Males (Butt Road)

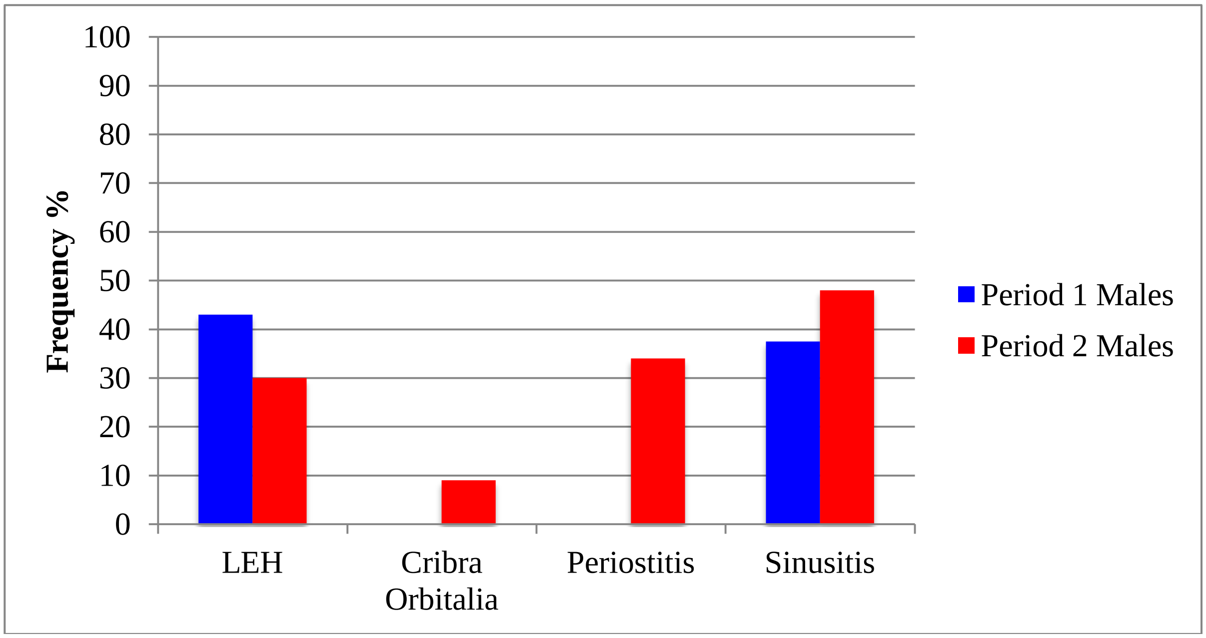


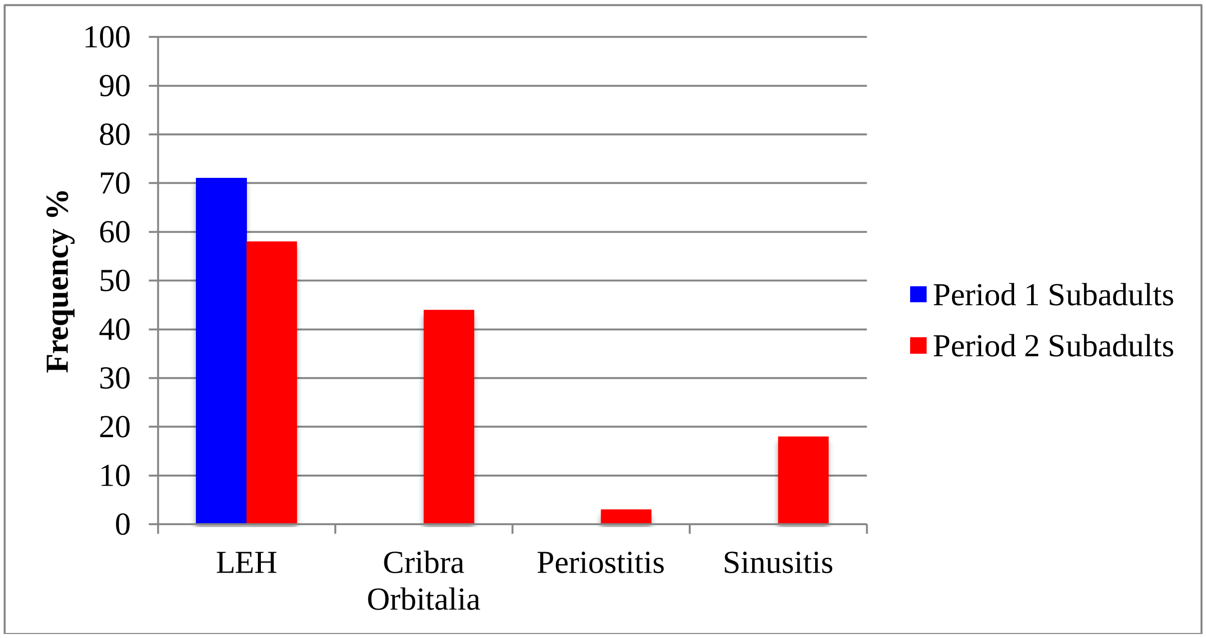
Table 26: Skeletal Indicators of Stress in Period 1 Subadults

Pathology	Present	Absent	Total Number	Frequency
LEH	5	2	7	*71*
Cribra Orbitalia	0	3	3	*0*
Periostitis	0	6	6	*0*
Sinusitis	0	3	0	*0*

Table 27: Skeletal Indicators of Stress in Period 2 Subadults

Pathology	Present	Absent	Total Number	Frequency
LEH	11	8	19	*58*
Cribra Orbitalia	14	18	32	*44*
Periostitis	1	30	31	*3*
Sinusitis	3	14	17	*18*

Figure 9: Frequency of Skeletal Stress Indicators in Subadults (Butt Road)



There appears to be little difference in skeletal stress between Period 1 and Period 2 demographic groups. However, the fragmentary nature and poor preservation of the Period 1 skeletal material may not accurately represent skeletal stress experienced by individuals living in Roman Colchester in the first to third centuries AD.

While the frequencies of LEHs are higher in Period 1 males, females, and subadults, there is not a significant difference between the temporal periods for LEHs. In both Period 1 and Period 2, there is a trend for subadults to have higher frequencies of LEHs than individuals who survive to adulthood.

Periostitis and cribra orbitalia are the skeletal indicators most affected by preservation issues in the sample. The skeletal material in the Period 1 sample is very fragmentary and weathered. For example, only three subadults in Period 1 have orbits available for observation of cribra orbitalia out of 12 subadults total in Period 1. In contrast, 32 subadults in Period 2 can be observed for cribra orbitalia out of 44 included in the Period 2 sample. Similarly, periostitis appears to affect Period 2 significantly more than Period 1. However, only 27 individuals out of 46 total in Period 1 have tibiae that are observable for periostitis. In Period 2, 87 individuals are observable out of 134 individuals included in the sample. Due to differences in preservation of critical skeletal elements needed to observe cribra orbitalia and periostitis between Period 1 and Period 2, it is difficult to identify true differences in frequencies between temporal periods.

Maxillary sinusitis frequencies are equal between Period 1 and Period 2 females and nearly equal for males. In addition there is little difference in frequency of sinusitis between males and females in each temporal period. This suggests that both sexes were exposed to poor (indoor) air quality. Given the temperate climate of England, both sexes probably spent a great deal of time indoors. Roman houses were often attached to shops or workshops so both sexes likely worked in similar indoor environmental conditions (Crummy, 2001; MacMahon and Price, 2005).

Age and Sex Differences in Period 2

Hypothesis 1b: There will be differences in the frequency of skeletal health indicators between males, females, and subadults in the Period 2 sample.

It is hypothesized that there will be significant differences in skeletal stress between males and females and between subadults and adults in Period 2. Surprisingly, the results of this comparison found relatively few differences between males and females (Table 28 and Figure 10). There are some significant differences in the frequency of skeletal health indicators between adults and subadults in Period 2. Due to small sample size, Pearson's chi-square cannot be calculated for all comparisons. Fisher's exact test is used to test for significance at the p= 0.05 level when cell sizes fall below five.

Cribra orbitalia is rarely expressed in adults in this sample. There is not a significant difference between males and females. When subadults are compared to adult groups, there is a significant difference between subadults and females ($\chi^2 = 8.86$ df=1) and males ($\chi^2 = 10.1$ df=1). The null hypothesis can be rejected; there is a significant difference in cribra orbitalia levels between adults and subadults. Subadults are more likely to have cribra orbitalia than males or females.

The only significant difference between males and females in Period 2 at the p=0.05 level is periostitis of the tibia ($\chi^2 = 4.23$ df=1). Males have more periostitis than females within the Period 2 sample. Periostitis was rare in subadults. However, there is no significant difference between adult females and subadults with periostitis in the Period 2 sample. There is a significant difference between adult males and subadults in Period 2.

There is not a significant difference in the number of males and females with LEHs in Period 2. This suggests that male and female children have equal access to care and nutrients during critical periods of development. However, individuals who survived to adulthood have significantly less LEHs than individuals that died in childhood.

There is not a significant difference between males and females with maxillary sinusitis in Period 2. There is a significant difference between adults and subadults with maxillary sinusitis in Period 2.

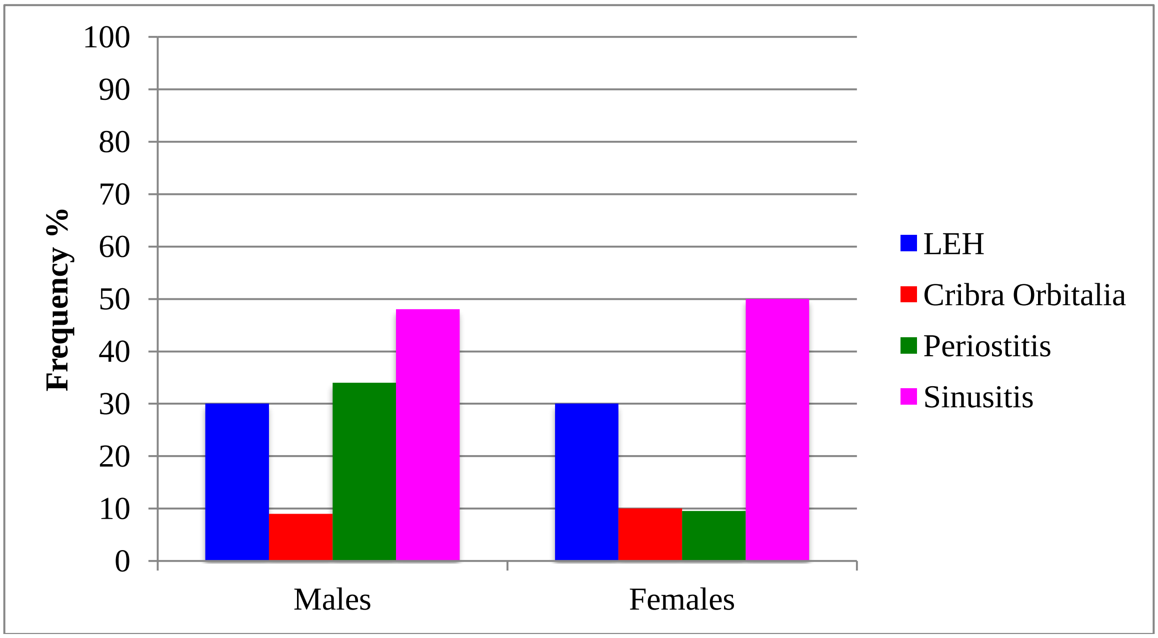
Pearson's chi-square and Fisher's exact test are used to compare adult age groups in period 2 at the p=0.05 level. There are no significant differences between young adults and middle age adults in period 2 (cribra orbitalia p=1, periostitis p=.13, LEHs p=0.65, sinusitis p=0.28). There are no significant differences between middle age adults and old adults in Period 2 (cribra orbitalia p=0.56, periostitis p=1, LEHs p=0.56, and sinusitis p=0.63).

Pearson's chi-square and Fisher's exact test are used to compare males and females in each age category for significant differences at the $p = 0.05$ level in the presence of health indicators. There are no significant differences between young adult males and females for cribra orbitalia, periostitis, and maxillary sinusitis. However LEHs (p=0.09) were significant at the p=0.1 level. Middle aged males and females have no significant differences in the presence of health indicators (cribra orbitalia p=1, periostitis p=.21, LEHs p=.24, and sinusitis p=1). Old adult males and females are not compared; the health indicators used in this study are not present in the old adults. There are no significant differences between unclassified males and females in Period 2.

Table 28: Frequencies of Skeletal Stress Indicators in Period 2 by Sex

Skeletal Stress Indicator	**Males Frequency (%)**	**Females Frequency (%)**
LEH	*30*	*30*
Cribra Orbitalia	*9*	*10*
Periostitis	*34*	*9.5*
Sinusitis	*48*	*50*

Figure 10: Frequency of Skeletal Stress Indicators in Period 2 by Sex



Subadult Age Group Differences

There are only five infants in the Butt Road sample and these are all from Period 2. These infants have normal eye orbits and normal periosteal surfaces. No permanent anterior teeth are available from these individuals so LEHs cannot be observed. Only one infant has an observable maxillary sinus and this was normal.

When the Early Child and Late Child groups are compared there is no significant difference in the presence of cribra orbitalia (p=0.67); periostitis (p=0.39); LEHs (p=1); and maxillary sinusitis (p=0.49). There are no significant differences between Late Child and Adolescent for cribra orbitalia (p=0.32), periostitis (p=1), LEHs (p=0.64), or sinusitis (p=0.6).

Summary of Hypothesis 1B

In contrast to the expectations of hypothesis 1b, there are few differences between adult males and females in Period 2. The presence of periostitis in males and females is significant at the p=0.05 level. Males have a much higher frequency of periostitis of the tibia than females (and the most severe cases of periostitis were in males). Periostitis of the tibia is often directly related to an injury to the tibia resulting in localized or systemic infection.

Several bioarchaeologists have suggested periostitis may also represent an impaired immune response due to psychosocial stress (Goodman and Martin, 2002; Cohen, 1988). Periostitis of the long bones and maxillary sinusitis are both examples of non-specific infections used as health indicators in this sample. The nearly equal rate of maxillary sinusitis in males and females suggests a similar immune response in the case of upper respiratory infections. However, males have significantly more periostitis on long bones than females. A division in labor between the sexes is probably the biggest factor in the development of periosteal infections in males in this sample. Differences in social stress experienced by the males in this sample may have played a role in their ability to recover from periostitis (Uchino, 2006).

The presence of LEHs in young adult males and females is significant at the p=0.1 level but when all males and females are compared, the presence of LEHs is not significant. The difference in sample size is likely due to sample size rather than real differences in health between males and females in that age group. There are five young adult females and only one young adult male in the Period 2 sample. The lack of differences between males and females for LEHs and cribra orbitalia suggest that male and female children receive relatively equal access to an adequate diet during critical periods of development. As discussed previously, similarities in the frequency of maxillary sinusitis suggest that males and females were spending relatively equal amounts of time in similar environments.

Skeletal Analysis Results Summary

The results of the skeletal analysis for the Butt Road cemetery sample appear to reflect a relatively ‘healthy’ population. Contrary to the expectations of hypothesis 1a, there are few significant differences between the samples from Period 1 and Period 2. There is significantly more periostitis of the tibia in Period 2, but this is likely due to poor preservation in Period 1 and may not reflect a true difference in stress between the samples.

The results of hypothesis 1b are also different than the expectations. Within the Period 2 sample, males and females generally reflect similar levels of skeletal stress with the exception of periostitis of the tibia. Cribra orbitalia and LEHs are primarily indicators of childhood stress. The lack of significant differences in these indicators between males and females in this sample suggest that males and females likely received similar care and adequate nutrition as children in this sample. Males have significantly more evidence of periostitis than females or subadults. This is probably indicative of a division of labor between the sexes where males were more likely to injure their lower legs. Males and females have nearly equal frequencies of maxillary sinusitis suggesting that both sexes were exposed to poor indoor air quality and likely had similar levels of dental health. As a result, males and females appear to have similar responses to respiratory and/or dental infections.

There are significant differences between subadults and adults for cribra orbitalia, periostitis, and LEHs. These indicators appear to have the most impact an individual's ability to recover and survive to adulthood. In contrast, periostitis and maxillary sinusitis are more frequent in adults. These represent more long- term infections. Individuals who died in childhood may not have had time to develop these non-specific infections.

In Chapter Five, the spatial relationships of demographic groups and skeletal stress indicators will be explored and discussed for Period 1 and Period 2. Chapter Six will present a series of osteobiographies from Period 1 and Period 2 of the Butt Road cemetery to provide insight into the variation of life experiences from the Butt Road cemetery. Chapter Seven will compare the combined results of Period 1 and Period 2 from the Butt Road cemetery to contemporaneous Romano-British cemeteries from London and Cirencester in order to place the Butt Road sample within a regional perspective of health in Roman Britain. Chapter Eight will incorporate the results from Chapters Four, Five, Six, and Seven into a discussion of health and mortuary behavior at the Butt Road Cemetery.

Chapter 5 Mortuary Analysis Results

Introduction

This chapter presents the results of the mortuary analysis of the Butt Road cemetery. The first part of the chapter presents the descriptions and frequencies of the mortuary variables used in this analysis. These include grave and head orientation, coffin type, and presence of grave goods by type and number. This data comes from the site report by Crummy et al. (1993). The spatial distributions of skeletal demography and skeletal stress indicators within each temporal period are described in the second part of the chapter. For each variable, differences between temporal periods and cemetery areas are explored. Then, the results of this analysis are used to reevaluate the criteria for identifying Christian cemeteries developed by Watts (1991). Finally, alternative explanations for the burial patterns seen in the Butt Road cemetery are considered. The possible burial rules and agents involved in burial are explored at the end of this chapter.

Coding of Mortuary Variables

Mortuary variables are coded based on the information available in Crummy et al. (1993). The coding system used for this analysis is available in the appendix. The following sections will summarize the results for the mortuary variables, but in general, there is surprisingly little variability within many of the mortuary variables and the implications of this consistency will be discussed at the end of this chapter.

Cemetery Subdivisions

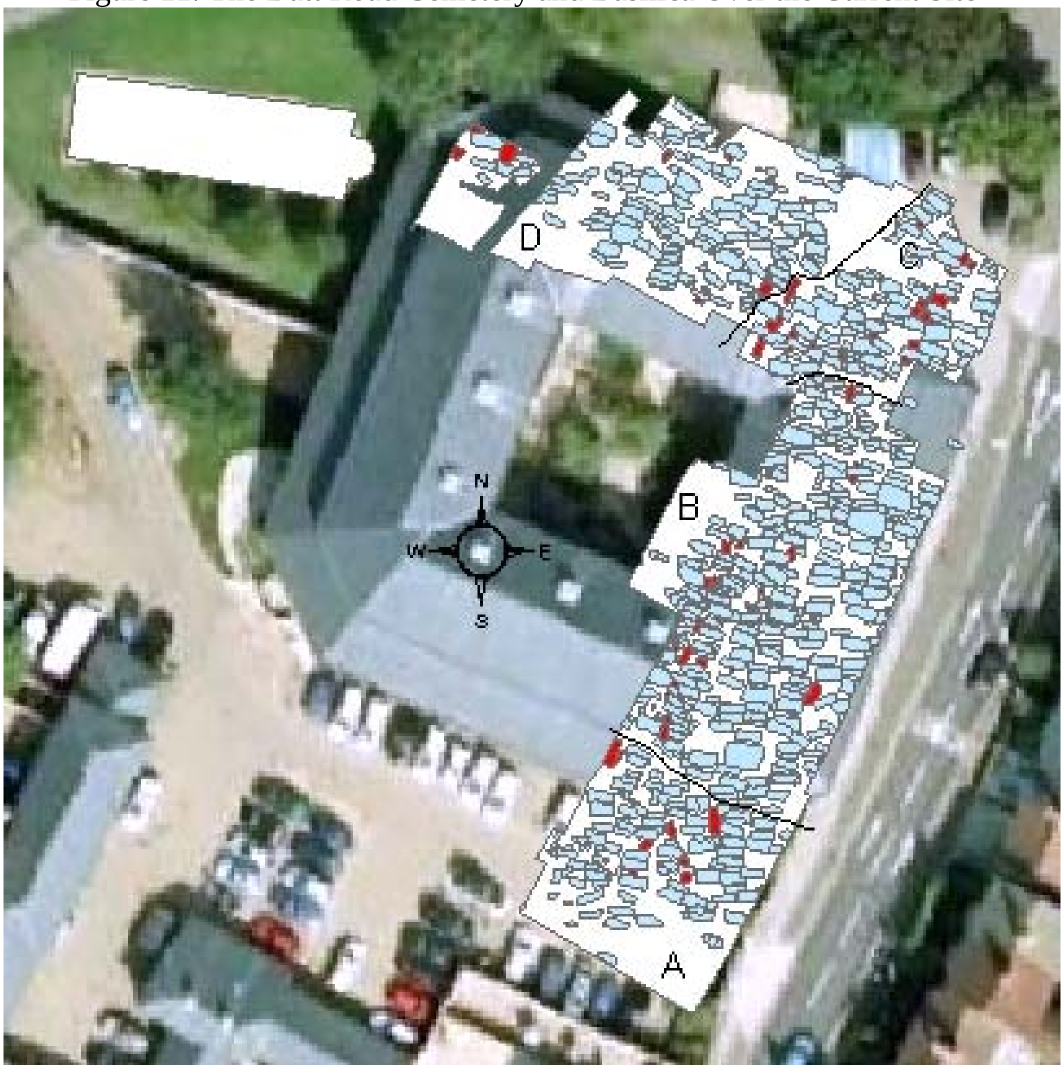
The excavators of the site assigned graves to either Period 1 or Period 2 (as described in Chapter Three Materials and Methods). In addition to comparing Period 1 to Period 2, this study divides the cemetery into four areas; A, B, C, and D (Figure 11). These areas are mainly for descriptive purposes but are based on what appear to be linear gaps visible within the cemetery. These gaps are very narrow and may not represent any intentional divisions by the agents responsible for these burials. However, the areas aid in discussing the distribution of mortuary and skeletal variables throughout the cemetery, and may help to identify differences in the distribution of some variables. The areas are not equal in size and do not contain equal numbers of graves, so the frequency of variables within each area is used to compare cemetery areas to each other.

Description of Mortuary Variables

Excavation of Graves

The Colchester Archaeological Trust excavated the Butt Road cemetery from 1976-79, 1986, and 1988 (Crummy et al., 1993). As described in Chapter Four, ArcMap is used to map the data from Period 1 and Period 2 for this study. Figure 11 displays the entire cemetery in relation to the foundations of the basilica from an aerial view of the site available through Google Earth. The basilica appears to date to the 4th century AD so it is not included in the Period 1 (1st-3rd century AD) maps. Figure 12 represents the Period 1 graves and indicates the areas of the cemetery used for descriptive purposes in this study. Figure 13 represents all of the Period 2 graves and includes the 4th century basilica. The graves selected for skeletal analysis using stratified random sampling are highlighted in this figure.

Figure 11: The Butt Road Cemetery and Basilica Over the Current Site[1]



[1](Aerial photo from Google Earth)

Figure 12: Period 1 Graves and Cemetery Areas

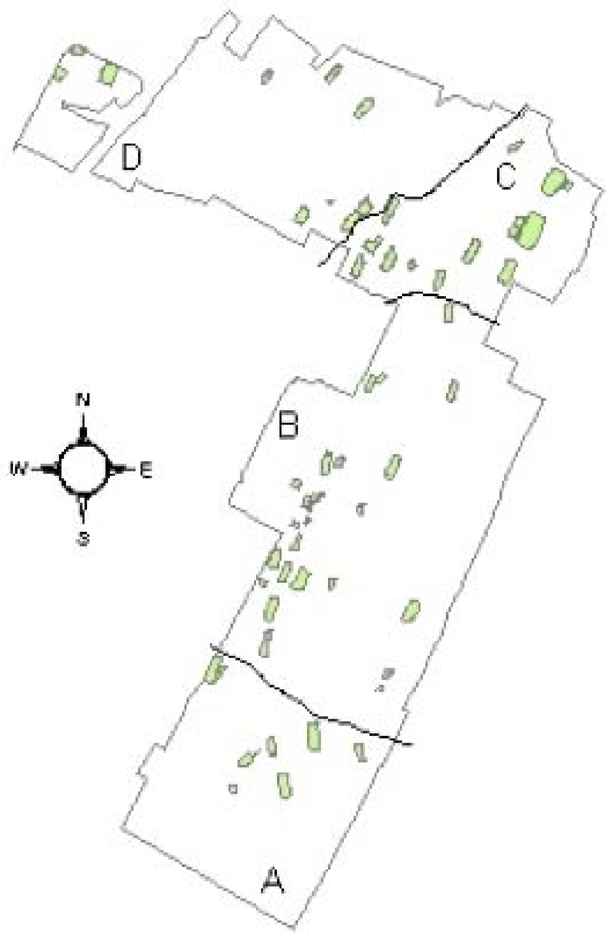
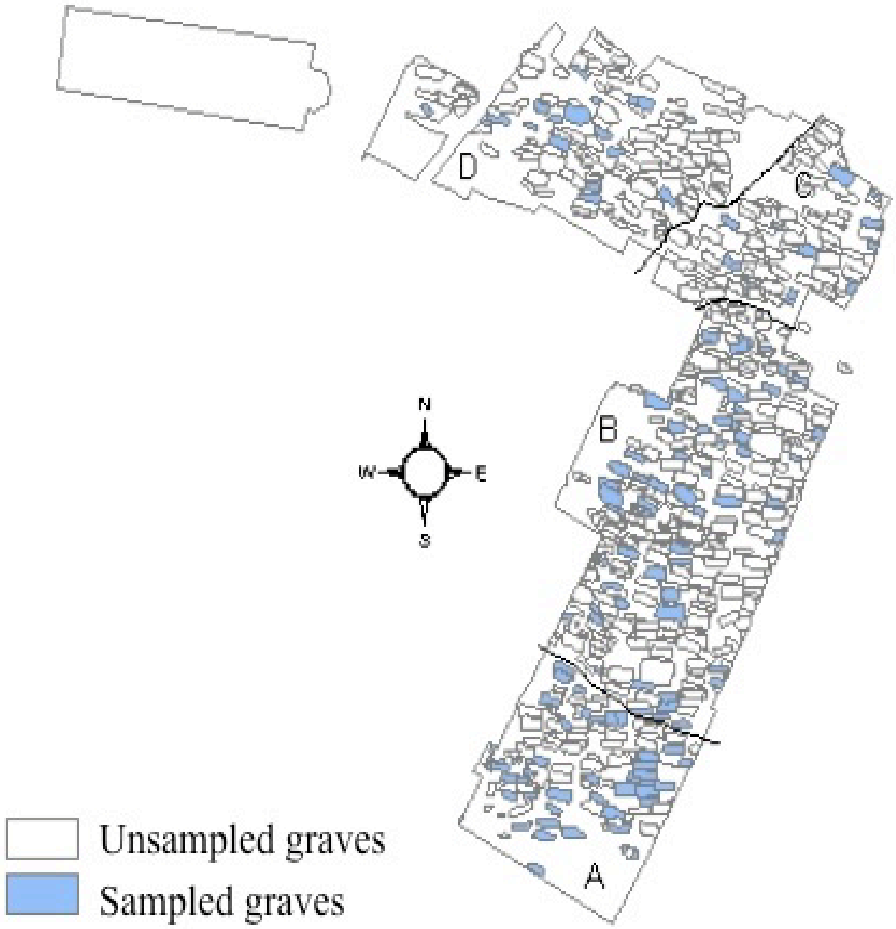


Figure 13: Period 2 Graves and Cemetery Areas



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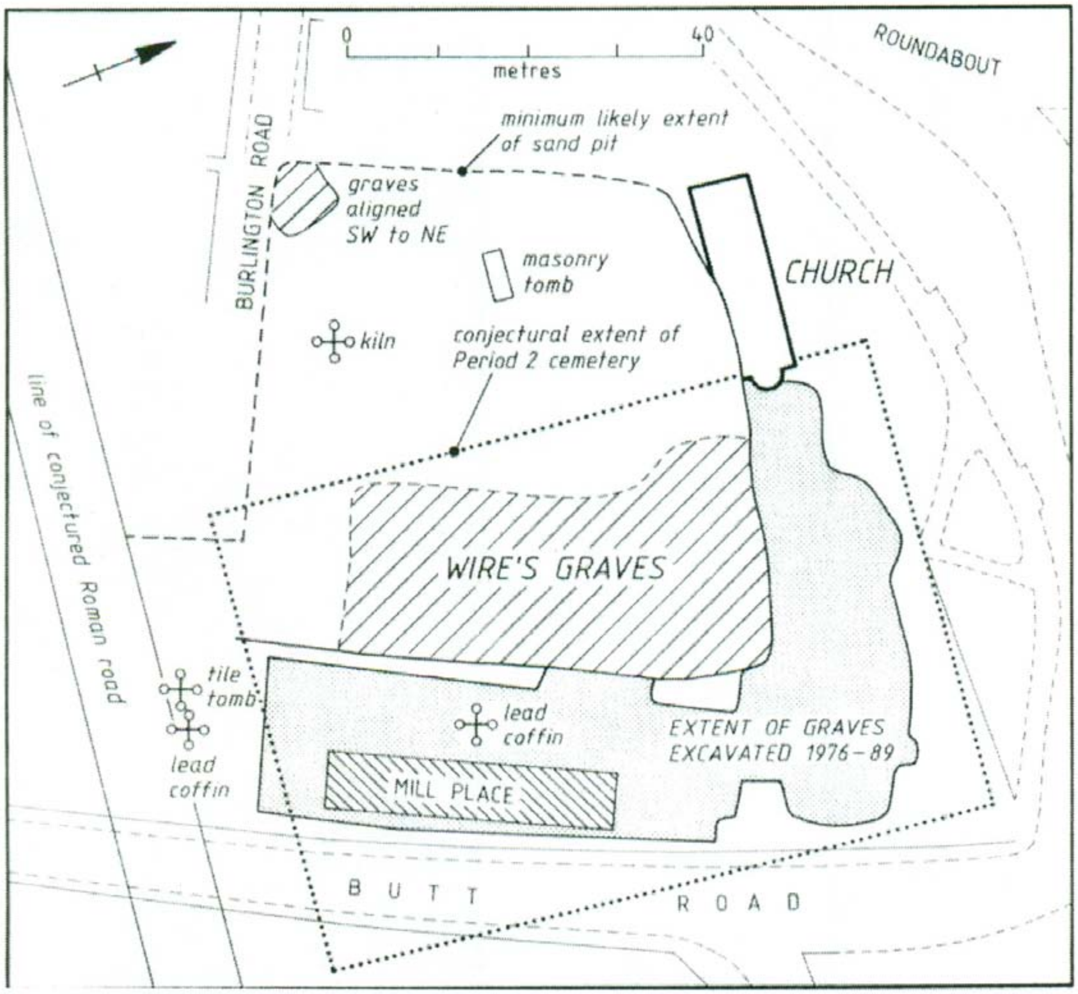
Crummy et al., (1993) developed the following categories to describe grave excavations: fully excavated, disturbed prior to excavation, possibly fully excavated, unused graves, not a grave, section, and section/plan. Table 29 presents the distribution of grave excavation types included in this analysis.

Table 29: Excavation of Graves

Type of Excavation	**Period 1 N**	**%**	**Period 2 n**	**%**	**Total Sample n**	**%**
No information available	**1**	*1.6*	**1**	*0.7*	**2**	*1*
Fully Excavated	**28**	*46*	**129**	*84*	**157**	*73*
Disturbed	**31**	*51*	**16**	*10*	**47**	*23*
Section	**0**	*0*	**7**	*5*	**7**	*3*
Section/plan	**1**	*1.6*	**0**	*0*	**1**	*0.5*
Total	**61**	*100*	1**53**	*100*	**214**	*100*

Figure 14, from Crummy et al. (1993), shows the location of the different excavations that have taken place in and around the Butt Road cemetery. The building foundations of the basilica are located at the northwest edge of the cemetery. A portion of the cemetery (Wire's Graves) was excavated in the 19th century, but neither the records nor the skeletal remains are available for study (Crummy et al., 1993). This creates some limitations for this study because the full extent of the area of the original Roman cemetery is not available for skeletal or spatial analysis.

Figure 14: The Known Extent of the Butt Road Cemetery[1]



[1]This study focuses on the area excavated from 1876-1989 (Crummy et al., 1993:6).

Burial Type

The excavators of the cemetery defined burial type by: inhumation, probable inhumation, cremation, unused grave, or unknown (Crummy et al., 1993). The table below presents the number of each burial type included in the sample used for this study. In both temporal periods, inhumations make up a majority of the burials (95% in Period 1 and 99% in Period 2).

Table 30: Burial type

Burial type	Period 1		Period 2		Total	
	n	**%**	**n**	**%**	**n**	**%**
Inhumation	**58**	*95*	**152**	*99*	**209**	*98*
Probable Inhumation	**1**	*2*	**0**		**1**	*.5*
Cremation	**2**	*3*	**0**		**2**	*1*
Unknown	**0**		**1**	*1*	**1**	*.5*
Total	**61**	*100*	**153**	*100*	**214**	*100*

Grave Alignment

Grave alignment was also recorded for the cemetery. Crummy et al. (1993) defined grave alignments as east/west or north/south. Period 1 is generally oriented north-south while Period 2 is generally oriented east-west. The table below presents the number and frequency of graves by alignment for both temporal periods.

Table 31: Grave Alignment

Grave Alignment	Period 1		Period 2		Total	
	N	**%**	**N**	**%**	N	%
North-South	**59**	*97*	**0**	*0*	**59**	*27*
East-West	**0**	*0*	**150**	*98*	**150**	*70*
Not known/recorded	**2**	*3*	**3**	*2*	**5**	*2*
Total	**61**	*100*	**153**	*100*	**214**	*99*

Head Orientation

The orientation of the skull was recorded if possible. This was recorded as west, east, north, south, or not known/recorded (Crummy et al., 1993) (Table 32).

Table 32: Head Orientation

Head Orientation	Period 1		Period 2		Total	
	n	%	n	%	n	%
East	**0**	*0*	**2**	*1*	**3**	*1*
West	**0**		**145**	*95*	**145**	*68*
North	**30**	*50*	**0**		**30**	*14*
South	**22**	*37*	**0**		**22**	*10*
Unknown/not recorded	**9**	*13*	**6**	*4*	**15**	*7*
Total	**61**	*100*	**153**	*100*	**214**	*100*

In Period 1, head orientation varies within cemetery area. About half of the graves have the head oriented to the north, while 37% of the graves have heads oriented to the south (Figure 15). Head orientation could not be determined for the remainder of the graves. Fisher's Exact Test and Pearson's Chi Square are calculated using SPSS to test for significance at the p= 0.05 level. There is not a significant difference between individuals with their heads oriented to the north or south for the entire cemetery (χ^2=1.67 df=1).

However, when head orientation is examined by area there is an interesting pattern. In area A, 75% of heads are oriented north. In area B, 63% of heads are oriented north, in C only 38% are oriented north and by area D only 10% of heads are oriented north. Crummy et al., (1993) suggest a Roman period road went past the south edge of the cemetery (described in Figure 16). This road would be closest to area A. It appears that individuals closest to the road were buried so that they "faced" the road and north head orientation decreases the further from the road individuals are buried (Figure 15). At the other end of the cemetery in areas C and D the majority of the graves are oriented south. Crummy et al. (1993) do not mention a road feature at this end of the cemetery but perhaps there was some other feature in the landscape that influenced the orientation of the graves at this end of the cemetery as well.

There is another interesting feature in Period 1 in areas B and C. A ditch feature (HF31/CF58) is located in the northeast edge of area B and continues into area C (Figure 16). Two Period 1 burials were placed (perhaps deliberately?) within this feature (Crummy et al., 1993). It is unclear if this feature served as a boundary for the cemetery or had some other purpose. It does not seem to be influencing grave or head orientation in areas B and C.

In Period 2, only two graves have heads oriented at the east end of the grave and both of these are in area A (Figure 17). This is statistically significant (χ^2=278.22 df=1). Crummy et al. (1993) and later excavators in 1997 suggest these two graves with heads oriented east may have been outside some type of boundary for the cemetery. These atypical burials will be discussed later in this chapter in more detail.

Figure 15: Head Orientation in Period 1

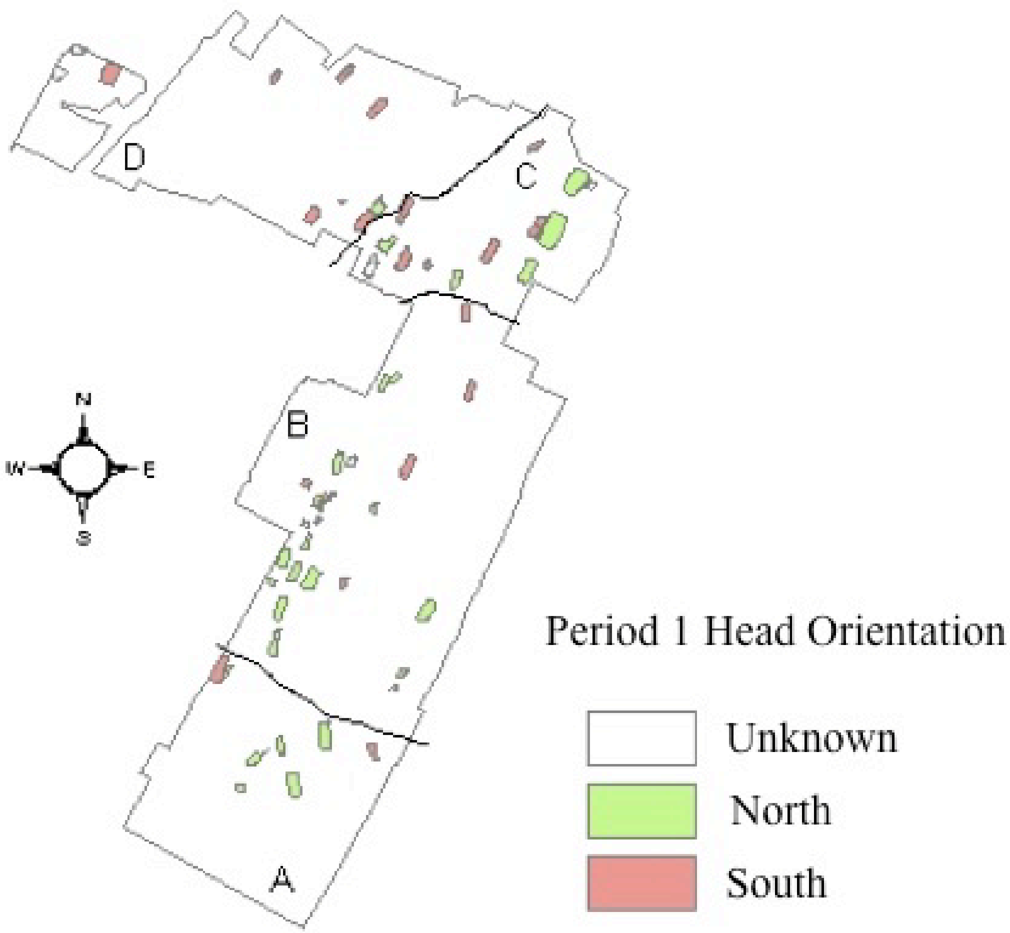


Figure 16: Ditch Feature in Period 1 and Roman road

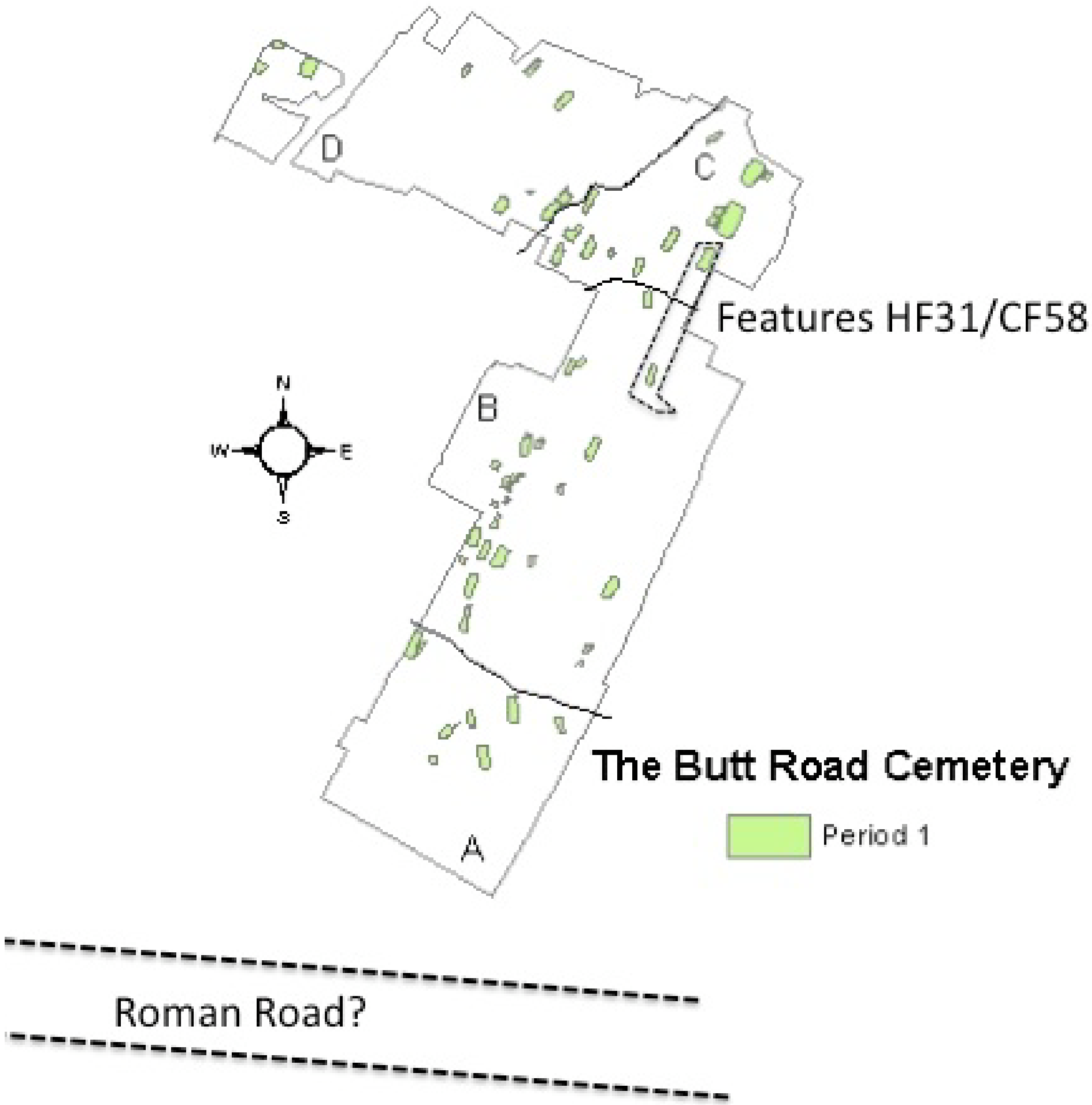
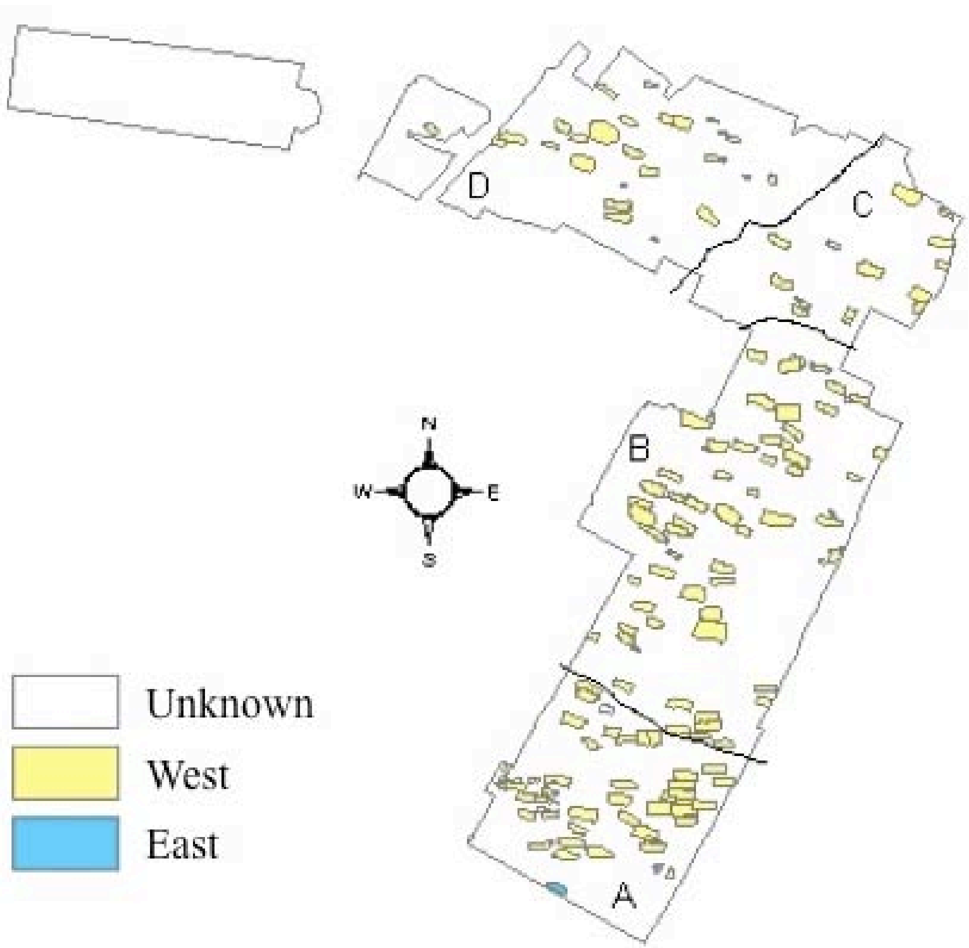


Figure 17: Head Orientation in Period 2



Coffin Type

Several different types of coffins are found in the Butt Road cemetery sample (Crummy et al., 1993). Most burials had simple wood or hollowed log coffins but several elaborately decorated lead coffins were found in Period 2 of the Butt Road cemetery (Crummy et al., 1993). None of the burials in lead coffins were selected in the stratified random sample of Period 2. Cremations were generally found in pottery or glass vessels. A few burials had tile overlaying the graves, which may have served as burial markers at one time.

In Period 1, nailed timber coffins are the most common type (Figure 18). A few coffins are made of timber but there is no evidence of nails associated with them. There is one nailed timber coffin packed with plaster (Grave 687) in Period 1 and one undisturbed cremation burial (Grave 650) in a lidded jar. These are both located in area C. Period 1 was more likely to have no evidence for the presence of a coffin. Perhaps some of the Period 1 burials were wrapped in a shroud rather than placed in a coffin.

In Period 2, a majority of burials are in nailed timber coffins (Figure 19). Area B contains two unique burials. Grave 225 is a nailed timber coffin in a vault while Grave 341 is lined with tile and likely contained an individual wrapped in textile (Crummy et al., 1993). The two burials in area A with heads oriented to the east were pit burials with no evidence for coffins. The head orientation of these two individuals appears to be intentional given that these individuals were buried without coffins or evidence for shrouds (Crummy et al., 1993).

Table 33: Coffin Types

Coffin type	Period 1		Period 2		Total	
	n	**%**	**N**	**%**	**n**	**%**
Nailed timber	**37**	*60*	**121**	*79*	**158**	*74*
Timber	**6**	*10*	**18**	*12*	**24**	*11*
Nailed timber + plaster	**1**	*2*	**0**		**1**	*0.5*
Nailed timber in vault	**0**		**1**	*1*	**1**	*0.5*
Log	**0**		**0**		**0**	
Tile	**0**		**1**	*1*	**1**	*0.5*
Nailed timber + lead+plaster	**0**		**0**		**0**	
Nailed timber + plaster in vault	**0**		**0**		**0**	
2 bodies per coffin	**0**		**0**		**0**	
Lidded jar	**1**	*2*	**0**		**1**	*0.5*
Tile? Or none?	**0**		**0**		**0**	
No coffin	**16**	*27*	**12**	*7*	**28**	*13*
Total	**61**		**153**		**214**	*100*

Figure 18: Period 1 Coffin Types

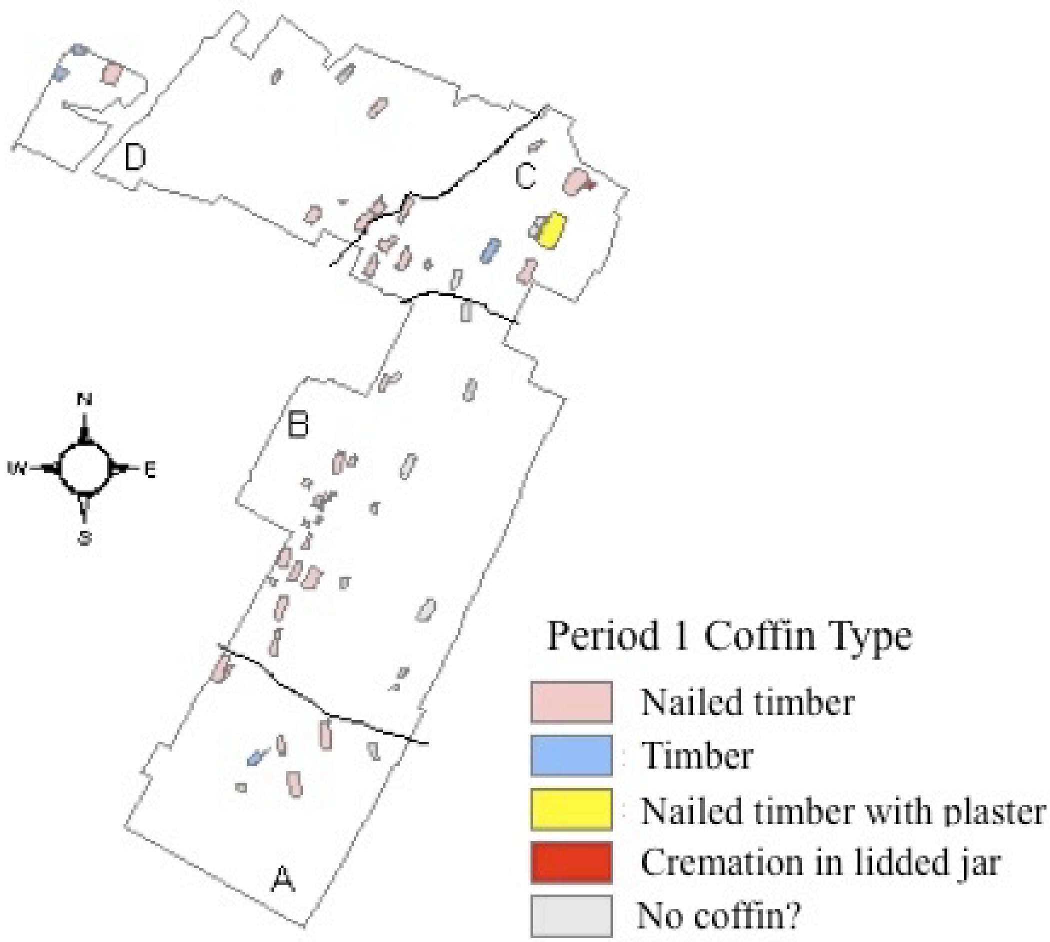
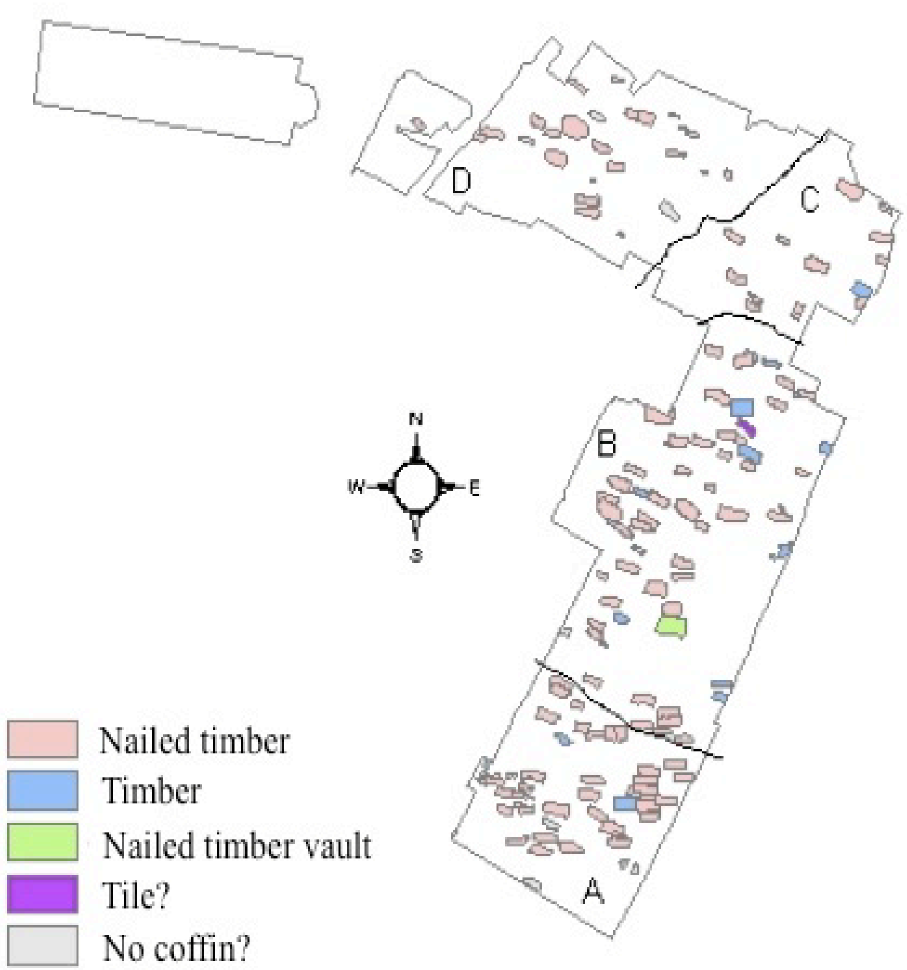


Figure 19: Period 2 Coffin Types



Grave Good Presence

Burials with at least one item that can be classified as a grave good are recorded based on presence/absence (Table 34). Grave goods are considered to be present if an individual is buried with at least one item of any of the following: personal adornment items (these include hairpins, armlets, necklaces, buckles etc), glass vessels, pottery, coins, footwear, knives, writing instruments, pewter vessels, and textiles. Graves with no indication of these items are recorded as absent. In the total sample, 50 graves have some type of grave good.

Table 34: Grave Good Presence

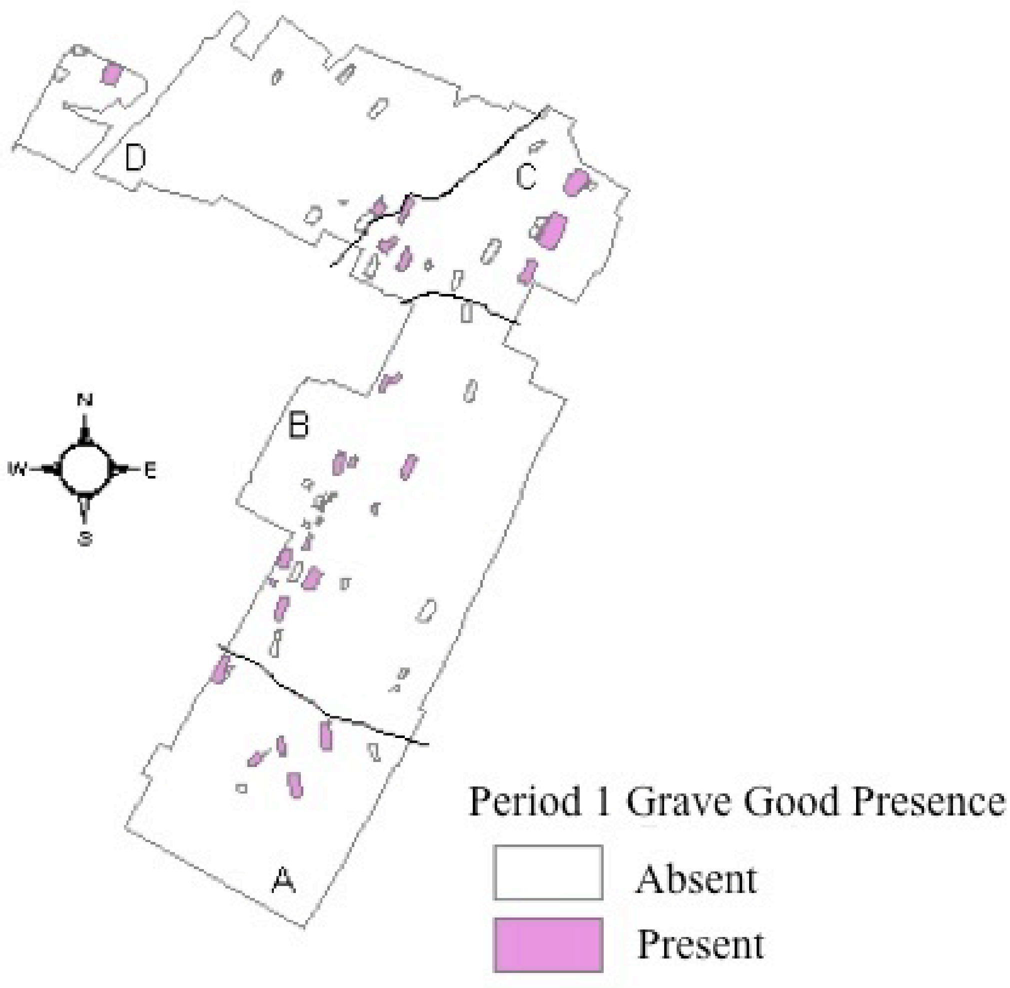
Grave Goods	**Period 1**		**Period 2**		**Total**	
	n	**%**	**n**	**%**	**n**	**%**
Present	**28**	*47*	**22**	*14*	**50**	23
Absent	**33**	*53*	**131**	*86*	**164**	77
Total	**61**	*100*	**153**	*100*	**214**	100

Spatial Distribution of Graves with Grave Goods

Period 1 has 28 graves (47%) that contained some type of grave good (Figure 20). While these graves are distributed throughout the cemetery, a visual inspection of the Period 1 cemetery suggests that there are may be clusters of graves with grave goods. The statistical toolbox in ArcGIS is used to conduct Getis-Ord General G (High/Low cluster analysis for variables within the Butt Road Cemetery. A High/Low cluster analysis for the presence of grave goods (0=Absent, 1=Present) results in a z score of 1.07 (p=0.28). This suggests that these clusters visible in Period 1 are likely due to chance and the individuals buried with grave goods are randomly distributed throughout the Period 1 cemetery.

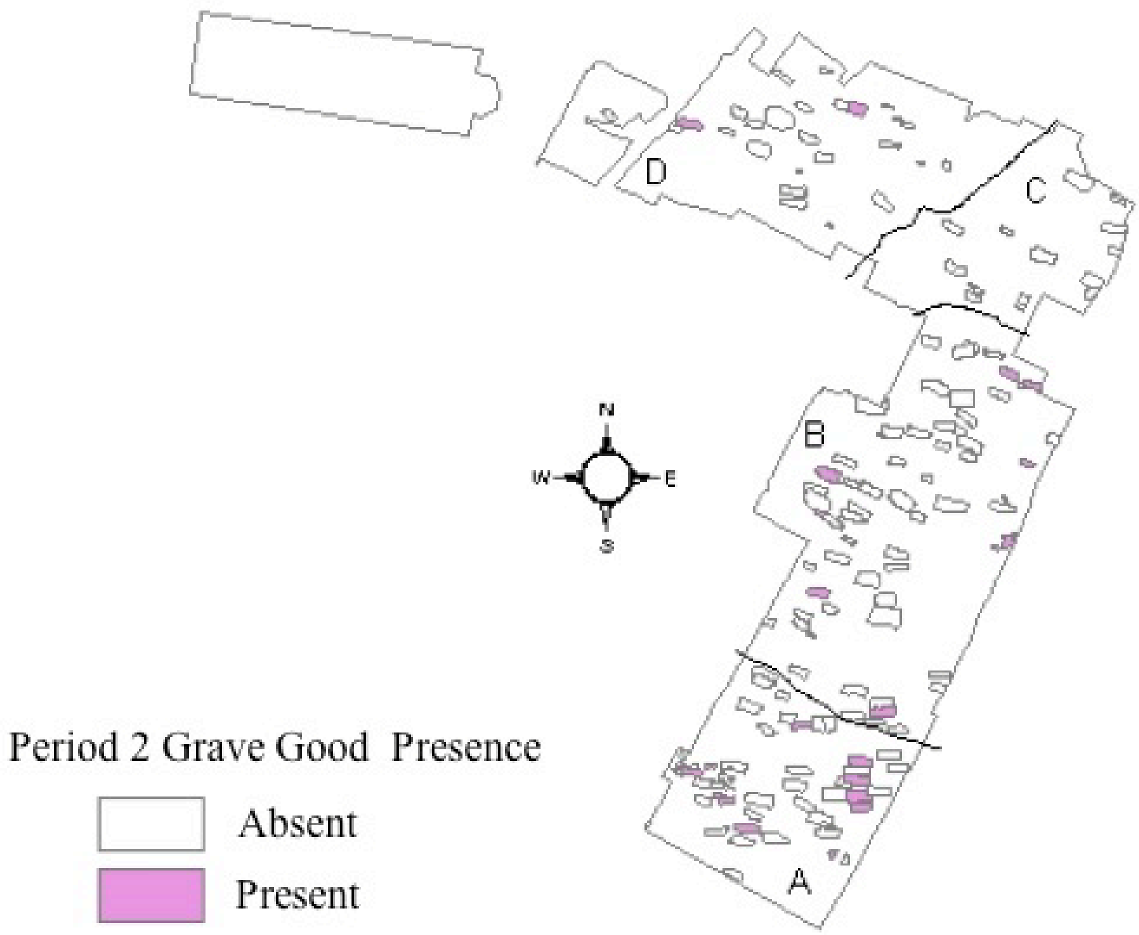
Fisher's exact test is calculated using SPSS to identify differences in grave good distribution between cemetery areas. When cemetery areas are compared there are significant differences at the p=0.05 level between area D and the other cemetery areas. Only 2 graves (20%) in area D have grave goods while 63% of graves in A, 52% of graves in B, and 44% of graves in C contain grave goods.

Figure 20: Grave Goods in Period 1



In Period 2, 22 graves out of 153 graves (16.4%) contained grave goods (Figure 21). One clear cluster is present in Area A; graves 171, 132, 180, 174. This is confirmed by a High/Low cluster analysis (z score= 2.48 p=0.01). More specifically, graves with goods are primarily located in Area A. When broken down by area, 24% of graves in A contained grave goods, while only 12% of graves in B had grave goods, and 8% of grave in area D had grave goods. No graves in area C contained grave goods in Period 2. This distribution may have been affected by the sampling strategy used in this study and further research including all graves in Period 2 is necessary to fully understand this distribution.

Figure 21: Grave Goods in Period 2



Differences in the presence of grave goods- Period 1 vs. Period 2

Pearson's chi-square and Fisher's exact test are calculating using SPSS to look for significant differences at the p=0.05 level in the presence of grave goods between temporal periods. There is a significant difference in the presence of grave goods between Period 1 and Period 2 (χ^2=25.01 df=1). When these differences are broken down by age and sex category there are significant differences in the presence of grave goods for adults but not subadults.

Period 1 adults are more likely to be buried with grave goods than Period 2 adults. When all adults from Period 1 and Period 2 are compared there is a significant difference between adults from Period 1 and Period 2 (χ^2=25.55 df=1). When adults are broken down by sex, this trend continues. Over half of Period 1 males (55%) and females (67%) were buried with grave goods. In contrast, only 7% of males and 8% of females in the Period 2 sample were buried with graves goods. Fisher's exact test is used to test for significance at the p=0.05 level resulting in clear differences in grave good inclusion between Period 1 and Period 2 (males p=0.0014, females p=0.0041).

On the other hand, there is not a significant difference between subadults in each temporal period. In Period 1, 42% of subadults were buried with grave goods while only 20% of Period 2 subadults were buried with grave goods. When subadults are compared by age category there are no significant differences between subadults from Period 1 and Period 2.

It is interesting that while the total number of graves with grave goods decreased significantly in Period 2, the demographic group most likely to be buried with grave goods is subadults. Females have slightly more grave goods than males in Period 2 and the type of grave goods included in burials in Period 2 may be related to sex or age.

Location of Grave Goods

For most of the cemetery, the location of the grave goods in relation to the skeleton is described in the burial plans (Crummy et al., 1993). The locations can be classified as: no grave good present, outside the coffin, inside the coffin, multiple grave goods both outside and inside the coffin, and unknown (Table 35).

Table 35: Location of Grave Goods

Location of Grave Goods	**Period 1 N= 60**		**Period 2 N = 153**		**Total N=213**	
	n	**%**	**n**	**%**	**n**	**%**
No goods	**32**	*53*	**131**	*86*	**163**	*77*
Outside coffin	**6**	*10*	**6**	*4*	**12**	*6*
Inside coffin	**11**	*18*	**14**	*9*	**25**	*12*
Both inside and outside	**7**	*12*	**2**	*1*	**9**	*4*
Unknown	**4**	*7*	**0**		**4**	*2*
	60	*100*	**153**	*100*	**213**	*100*

In Period 1 there are 28 graves with grave goods. Of these, 21% have grave goods located outside the coffin, 39% have goods located inside the coffin, and 25% have grave goods both inside and outside of the coffin (Figure 22). There are 4 graves (14%) for which the location of the grave goods in relation to a coffin is unknown.

In Period 2, there are 22 graves with grave goods (Figure 23). Of these 22% have grave goods outside the coffins, 64% have good located inside the coffins, and 9% (2 graves) have good located both inside and outside the coffin. The presence of grave goods inside the coffin versus outside the coffin is compared for both periods. There is not a significant difference in Period 1 (χ^2=2.11 df=1). There is a significant difference in grave good location between goods inside the coffin and outside the coffin in Period 2 (χ^2=5.87 df=1). It appears then that in Period 2, if grave goods were included in the burial, they were more likely to be included inside the coffin. Grave good type may also play a role in location. In Period 2, most grave goods were personal adornment items rather than pottery or glass vessels.

Figure 22: Location of Grave Goods in Period 1

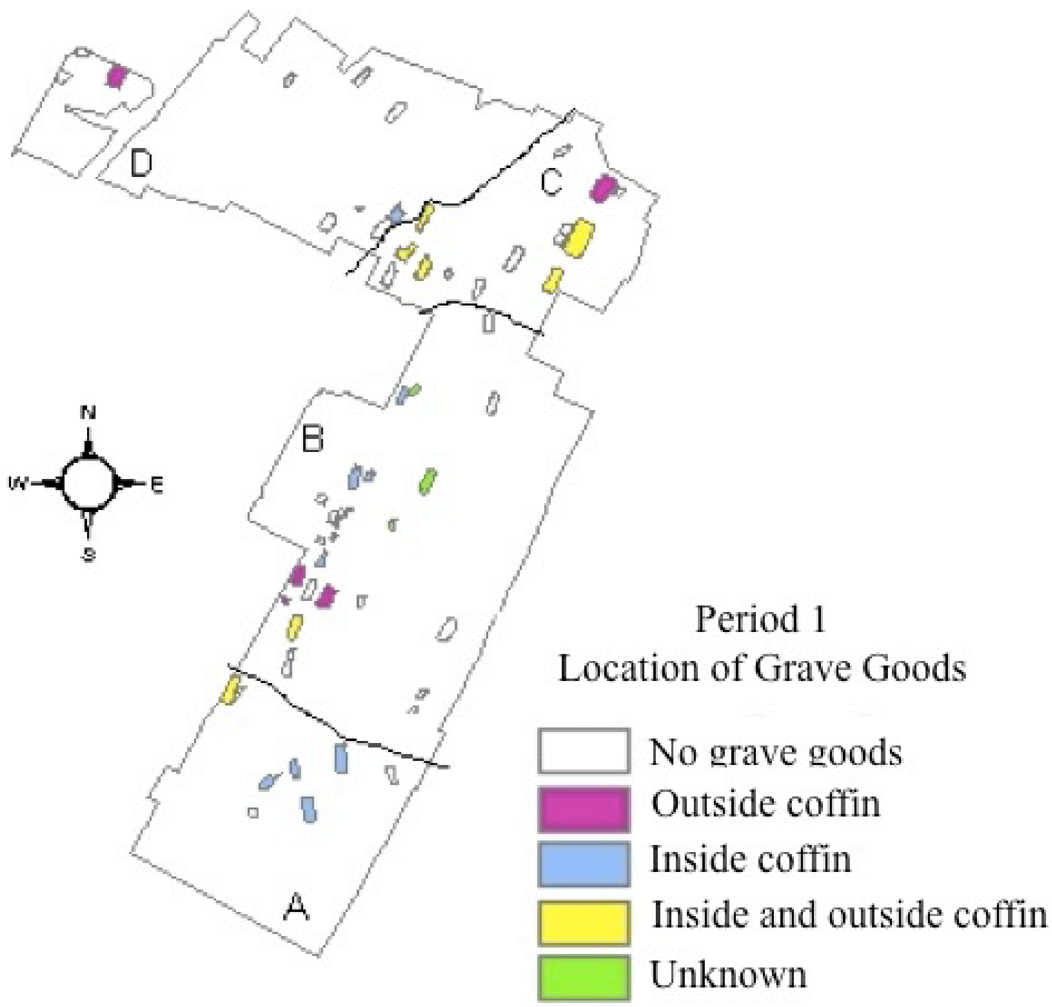
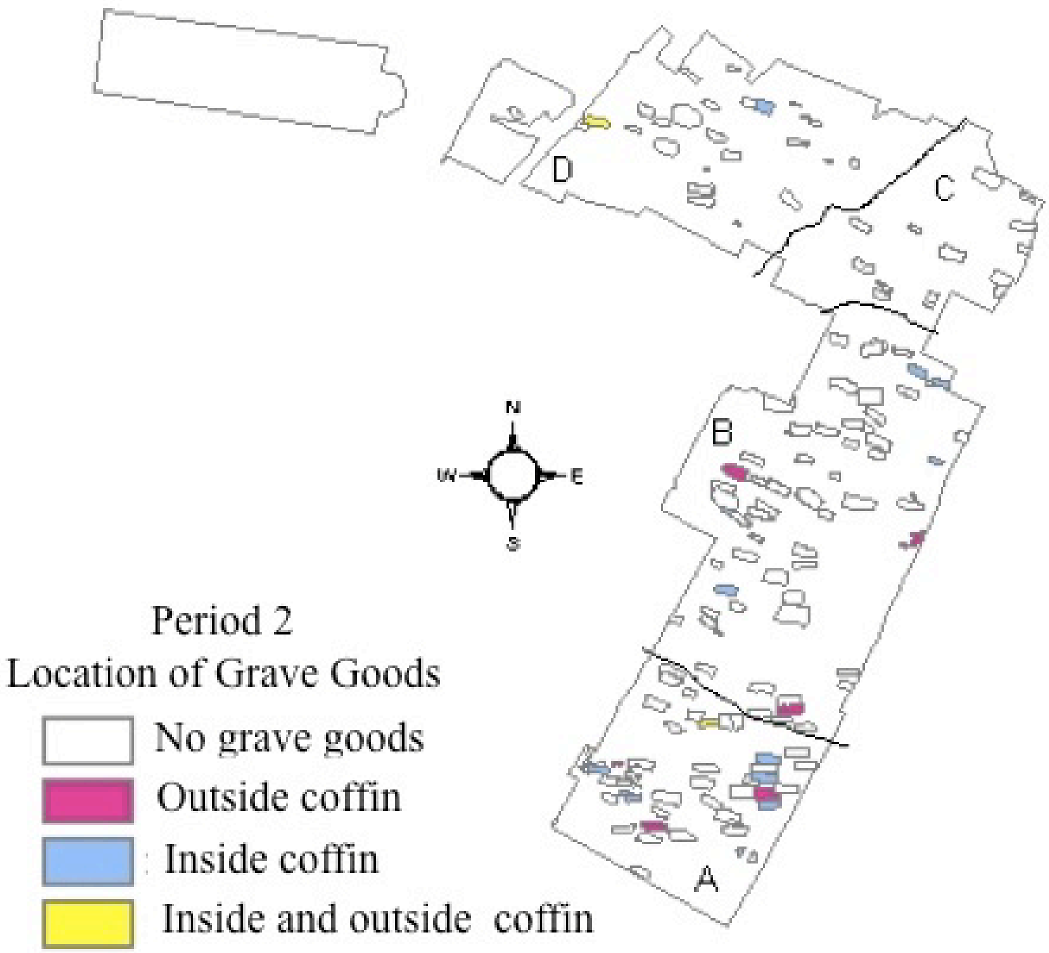


Figure 23: Location of Grave Goods in Period 2



Grave Goods by Type

Grave goods are divided into the following categories: personal adornment items, glass vessels, pottery, coins, footwear, knives, textiles, writing instruments, and pewter vessels (Table 36). Personal adornment items included hairpins, armlets, necklaces, belt buckles, and hairpins (Crummy et al., 1993). The number of each type of grave good is included in the analysis based on the site report by Crummy et al. (1993).

Table 36: Number of Graves Containing Each Type of Grave Good

	Period 1 N=61		Period 2 N=153		Total Sample N=214	
Grave Good Type	**N**	**%**	**n**	**%**	**n**	**%**
Personal adornment items	**6**	*10*	**14**	*9*	**20**	*9*
Glass vessels	**2**	*3*	**5**	*3*	**7**	*3*
Pottery	**20**	*33*	**3**	*2*	**23**	*11*
Coins	**1**	*2*	**2**	*1*	**3**	*1*
Footwear	**11**	*18*	**2**	*1*	**13**	*6*
Knives	**0**	*0*	**1**	*1*	**1**	*0.5*
Textiles	**2**	*3*	**3**	*2*	**5**	*2*
Writing Instruments	**1**	*2*	**0**	*0*	**1**	*0.5*
Pewter Vessels	**1**	*2*	**0**	*0*	**1**	*0.5*

*It should be noted that some graves contained multiple types of grave goods. The frequencies in this table are based on the number of graves with each grave good type/total number of graves in each temporal phase.

Personal Adornment Items

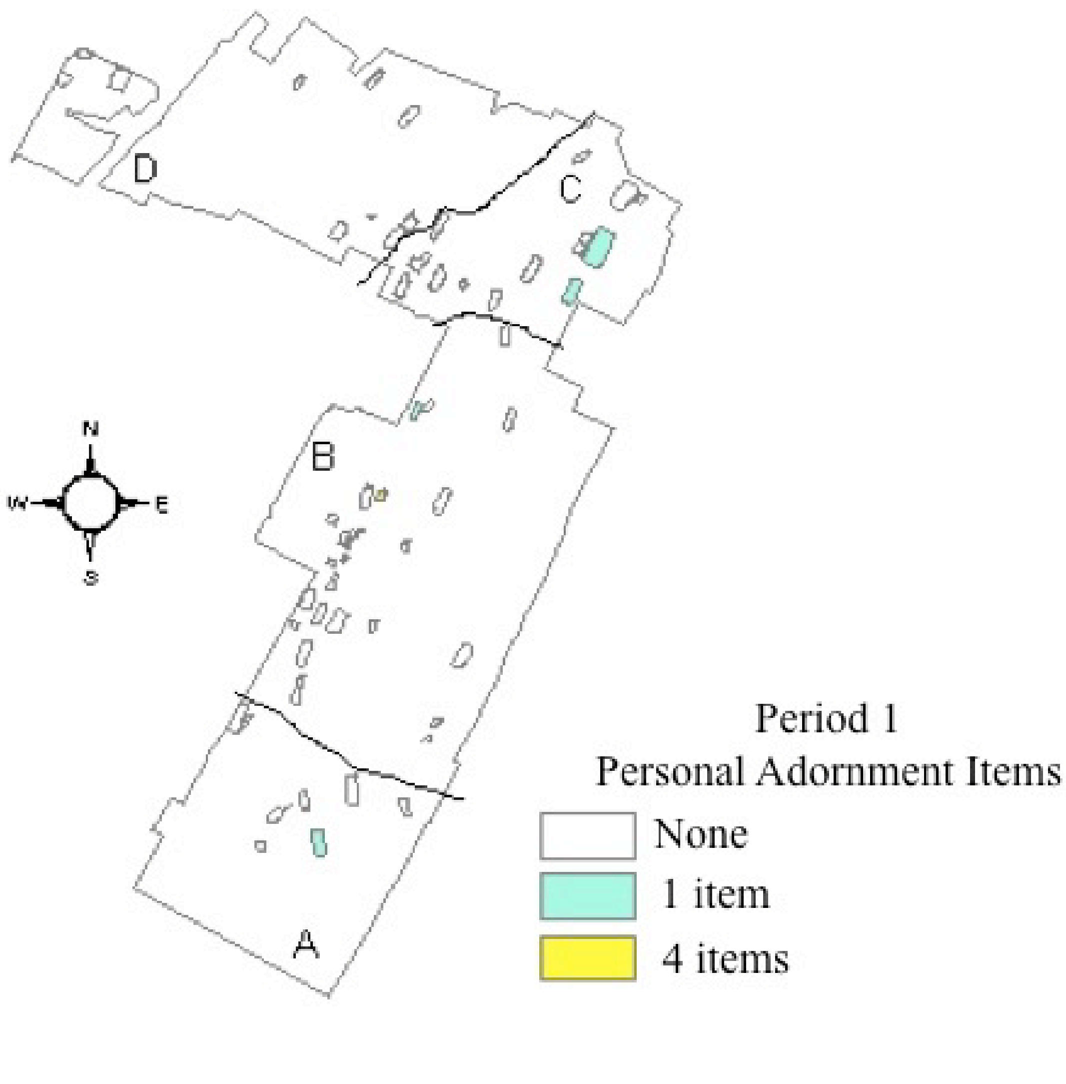
Personal adornment items include hairpins, rings, and other jewelry. Personal adornment items are relatively rare in this cemetery but several graves contained multiple items. The table below breaks down items by the number included in each grave.

Table 37: Graves Containing Personal Adornment Items

Number of items	Period 1		Period 2		Total Sample	
	N	**%**	**n**	**%**	**n**	**%**
0 items	**55**	*90*	**139**	*91*	**194**	*91*
1 item	**5**	*8*	**2**	*1*	**7**	*3*
2 items	**0**		**3**	*2*	**3**	*1*
3 items	**0**		**3**	*2*	**3**	*1*
4 items	**1**	*2*	**1**	*0.7*	**2**	*1*
5 items	**0**		**2**	*1*	**2**	*1*
6 items	**0**		**2**	*1*	**2**	*1*
9 items	**0**		**1**	*0.7*	**1**	*0.5*
	61	*100*	**153**	*100*	**214**	*100*

In Period 1, 6 graves (10%) contain personal adornment items (Figure 24). Three of these were female burials (Graves 679, 687, and 126,) one was for a male (Grave 327), and two contained poorly preserved adults (Graves 291 and 278). No subadults in period 1 were buried with personal adornment items. No clusters are apparent in Period 1 although Graves 679 and 687 seem to be part of the same row and Graves 291 and 278 are also in close proximity.

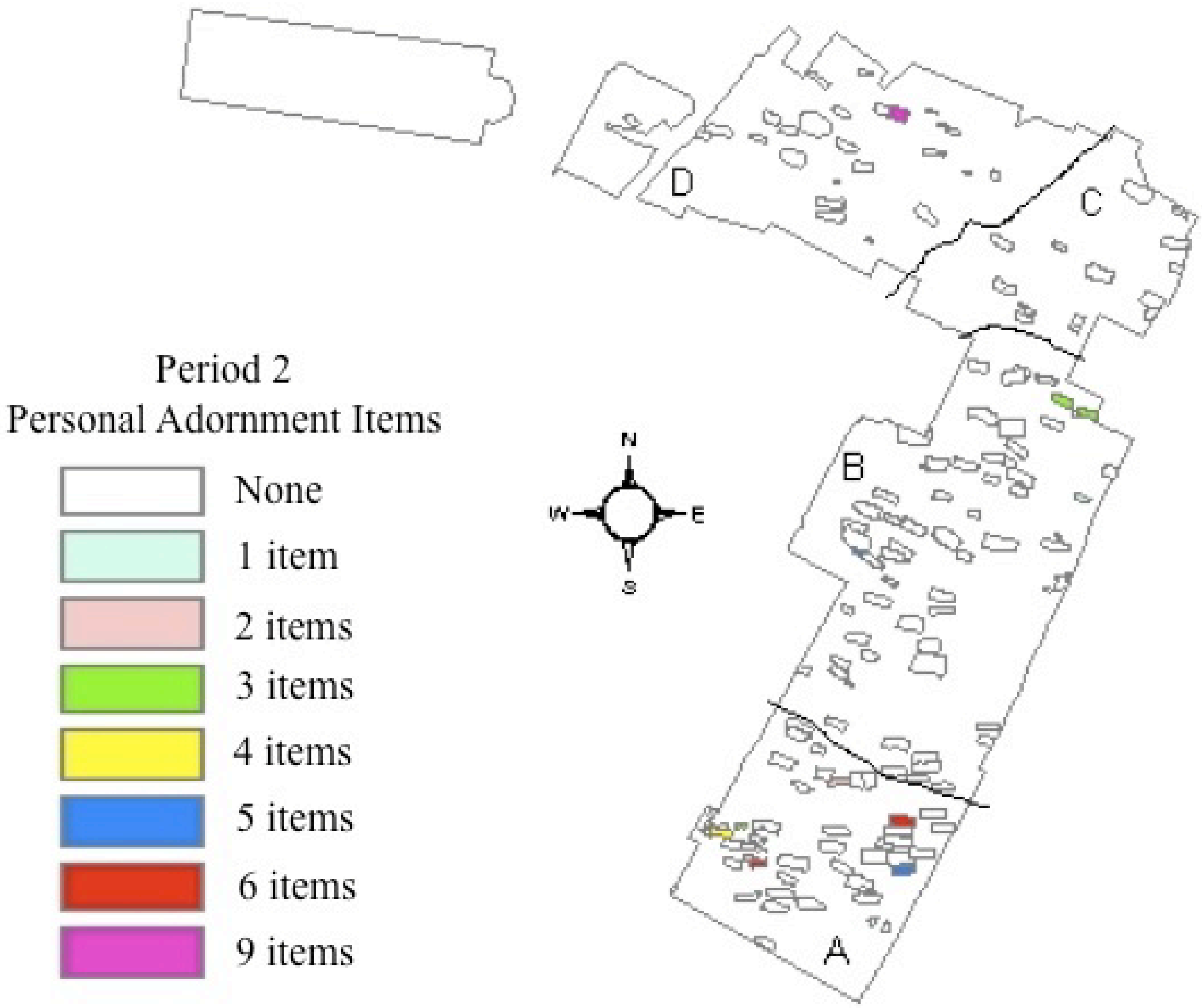
Figure 24: Personal Adornment Items in Period 1



In Period 2, 14 graves (9%) contain personal adornment items (Figure 25). This can be broken down into 8 subadults (Graves 16, 115, 342, 347, 378, 454, 519, and 638), one female (Grave 174) and five poorly preserved adults (Graves 1, 15, 24, 171, 4101). Personal adornment items appear to be concentrated in areas A and B. No graves in area C contained personal adornment items. Two graves in area D contained personal adornment items. One of these (Grave 519) contained nine items--the largest number of objects in the sample.

A visual inspection suggests that personal adornment items occur in clusters and High/Low clustering supports the visual inspection. Personal adornment items are highly clustered in Period 2 (z score = 2.48 p=0.01). It is also interesting that 57% (8/14) of individuals with personal adornment items are subadults.

Figure 25: Personal Adornment Items in Period 2



Differences in the Presence of Personal Adornment Items

Fisher's exact test is calculated using SPSS to test for significance at the p=0.05 level for differences in the number of personal adornment items included between demographic groups. There is not a significant difference in the presence of personal adornment items between Period 1 and Period 2 (p=0.4). However, when broken down by age group and sex, there are differences. No subadults in Period 1 were buried with personal adornment items while eight subadults were buried with personal adornment items in Period 2.

No males in either time period are buried with personal adornment items, but there is a significant difference in the presence of personal adornment items between all adults (p=0.049) and females (p=0.007) in Period 1 and Period 2. There is no significant difference in the presence of personal adornment items between subadult age groups in Period 2 (Early child vs. Late Child p=0.4 and Late Child vs. Adolescent p=0.62), but when groups are compared within temporal periods there are significant differences between subadults and adults in Period 2 (p=0.0013).

There appears to be a shift from Period 1 to Period 2 in the perception of subadults and the type of grave goods provided for them. Over half of the individuals with personal adornment items in Period 2 are subadults. While there is not a distinction in the type of grave goods in adult graves versus subadult graves, it seems likely the type of personal adornment item included with individuals is based on sex or social status rather than age. Hairpins were recovered from one female grave (Grave 174) and three subadult graves (Graves 115, 342, and 519). The subadults buried with hairpins are aged between 7 and 12 years of age. Roman women and girls are often portrayed in sculpture with elaborate hairstyles that would have required hairpins, so these individuals may have been girls who had become old enough to wear their hair in more elaborate styles (Bartman, 2001).

Necklaces and armlets were also common personal adornment items associated with some individuals. Unfortunately, none of the individuals buried with these artifacts could be sexed. One adult with a necklace and armlets was also buried with a knife. Petts (1998) noted that both males and females were buried with knives in other Late Roman cemeteries. Therefore, knives do not appear to be linked to sex. Necklaces and armlets were made out of a variety of materials including copper, glass beads, amber beads, bone, and shale (Crummy et al., 1993), so it is also possible that these artifacts may be related to social status rather than sex.

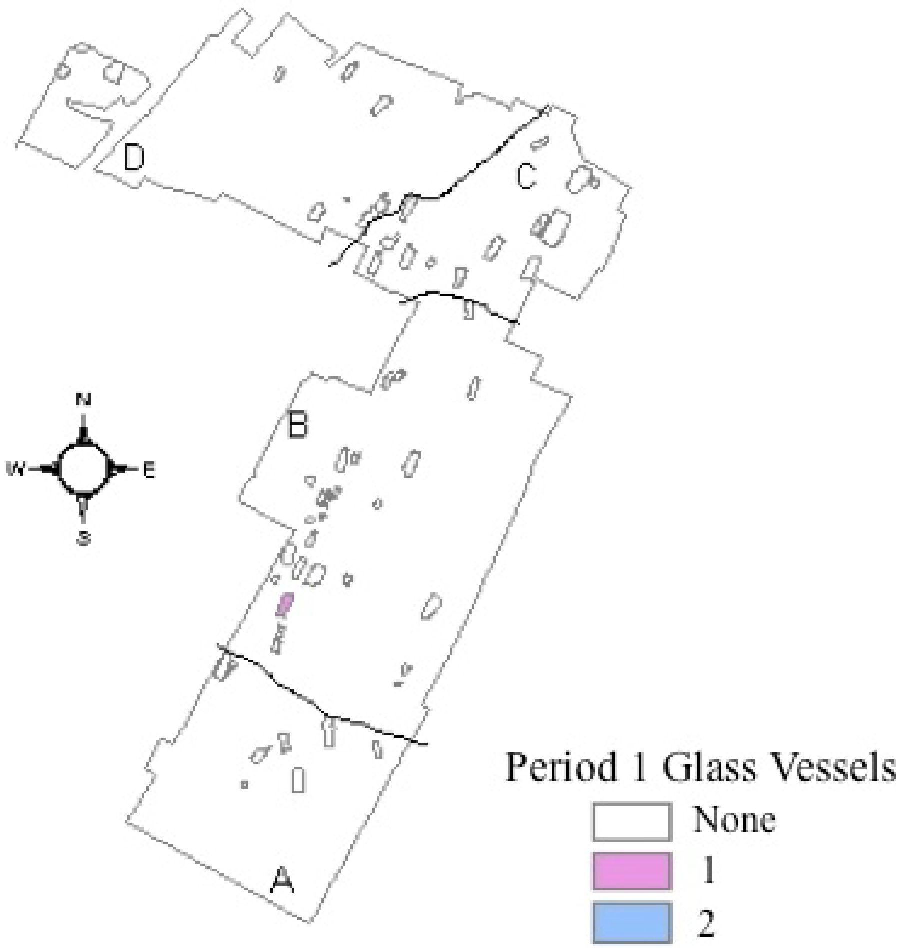
Glass Vessels

A total of 7 graves (3%) contain glass vessels in the whole sample (Table 38). Two of these graves (3%) are from Period 1 (Figure 26). These graves are isolated from each other (Graves 100 and 6931) but are located near graves that contained other types of grave goods. Grave 100 is a poorly preserved adult and Grave 6931 is a female. High/Low clustering suggests that the presence of glass vessels in Period 1 is random (z score =-0.28, p=0.78).

Table 38: Graves Containing Glass Vessels

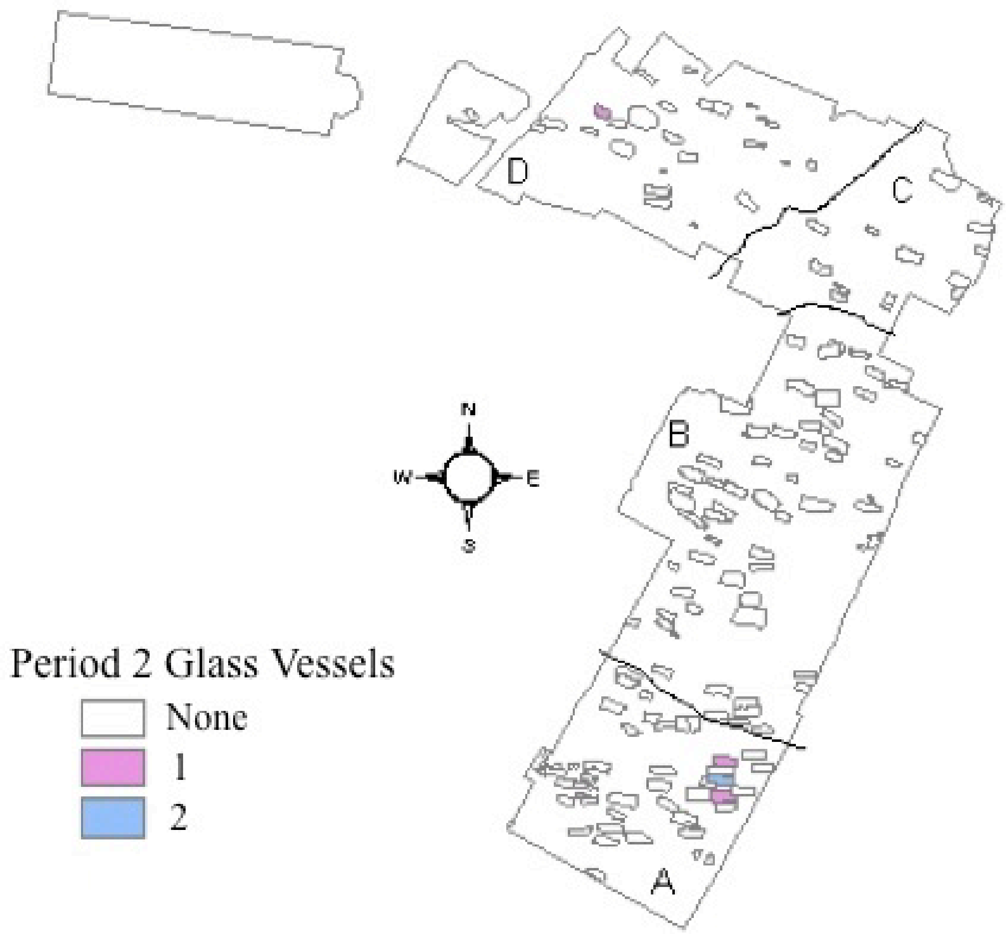
Number of vessels	**Period 1 N=60**		**Period 2 N=153**		**Total N=213**	
	N	**%**	**n**	**%**	**n**	**%**
0 glass vessels	**58**	*97*	**148**	*96.7*	**206**	*97*
1 glass vessel	**1**	*2*	**4**	*2.6*	**5**	*2*
2 glass vessels	**1**	*2*	**1**	*0.7*	**2**	*1*
Total graves w/ glass	**2**	*3*	**5**	*3*	**7**	*3*

Figure 26: Glass Vessels in Period 1



In Period 2, five graves (3%) contained glass vessels (Figure 27). Three of the graves with glass are in a cluster (Graves 132, 180, and 174). The other two (Graves 15 and 727) are isolated. Glass grave goods appear to be associated with adults. Unfortunately, most of these skeletons could not be sexed but both a male (G180) and a female (G174) were buried with glass vessels. Most of these graves were located in Area A. Only one grave with glass is located in Area D (G727). High/Low clustering indicates that Period 2 has a high cluster of graves with glass vessels (z score = 6.42 p=0.00).

Figure 27: Glass Vessels in Period 2



Fisher's exact test is calculated using SPSS to test for significance at the p=0.05 level between demographic groups for the inclusion of glass vessels. There is no significant difference in the number of graves with glass vessels present between Period 1 and Period 2 (p=1). No males in Period 1 are buried with glass and no subadults in either time period are buried with glass. There is not a significant difference in the presence of glass between Period 1 females and Period 2 females (p=0.27). One middle-aged male in Period 2 is buried with glass grave goods, but there is no significant difference between males and females with glass in Period 2.

Pottery

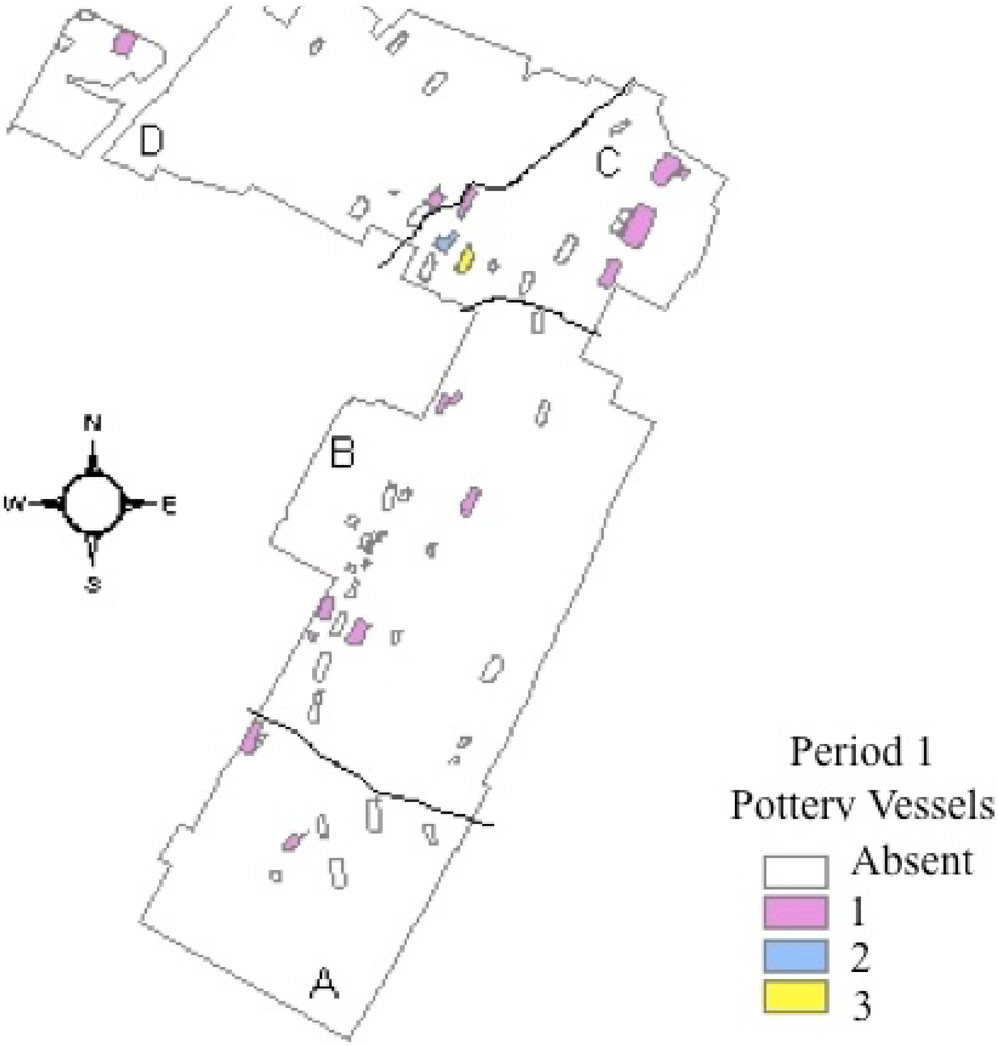
A total of 23 graves in the sample contain pottery. In Period 1, 20 graves (33%) have at least one pottery vessel and inn Period 2, only three graves (2%) contain pottery (Table 39).

Table 39: Graves Containing Pottery Vessels

Number	**Period 1 N=60**		**Period 2 N=153**		**Total N=213**	
	n	**%**	**n**	**%**	**n**	**%**
0	**40**	*67*	**150**	*98*	**190**	*89*
1 vessel	**17**	*28*	**2**	*1*	**19**	*9*
2 vessels	**2**	*3*	**1**	*0.7*	**3**	*1*
3 vessels	**1**	*2*	**0**	*0*	**1**	*0.5*
Total graves w/vessels	**20**	*33*	**3**	*2*	**23**	*11*

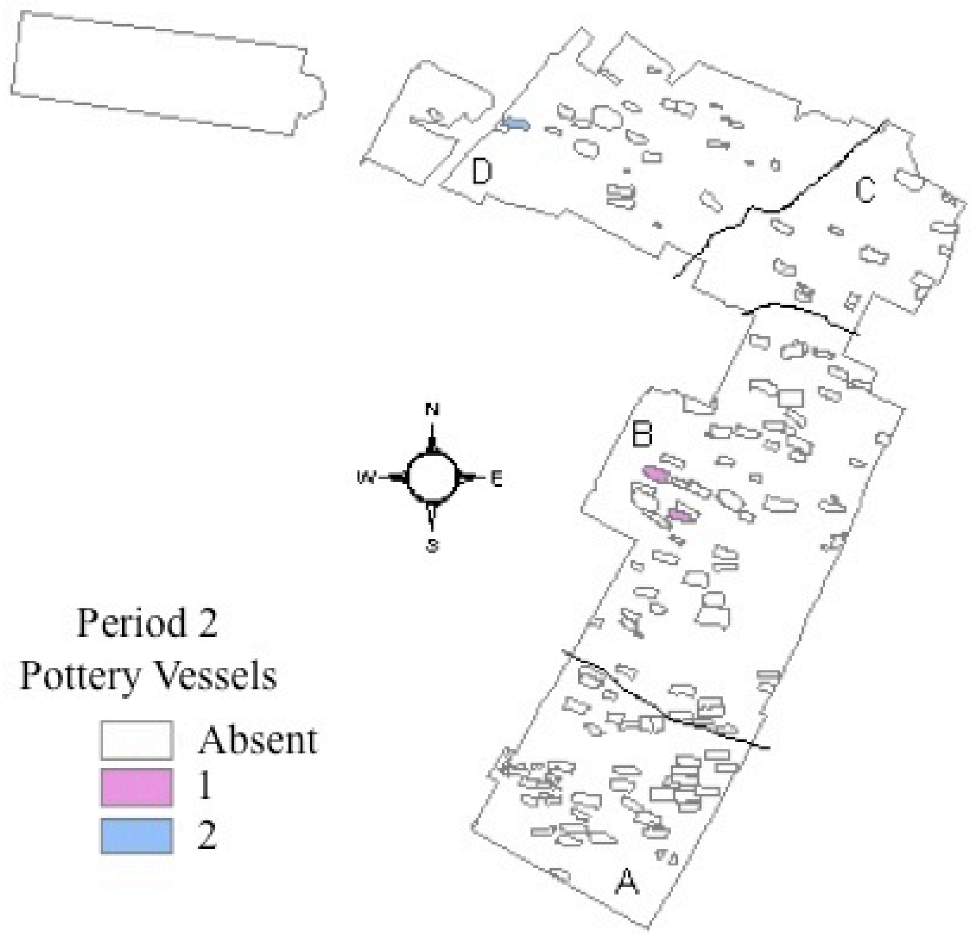
In Period 1, the distribution of these graves is not limited to any one area although pottery appears to be concentrated in Area C (Figure 28). There are two clusters visible (Graves 533, 554, 555, 601 and Graves 679, 687, 676, 650). It should be noted that the pot in Grave 650 is contained a cremation of a child. Apart from these two clusters, the burials with pottery are intermixed with plain burials. However, these burials are loosely organized in rows (Row 1 graves 70, 95, 99, 291, 337, and 324), Row 2 graves 223, 297, and 305. Two graves containing pottery are slightly more isolated, (Graves 170 and 624) and do not readily fit into rows or clusters. Grave 624 is located in the north-west corner of the cemetery in Area D. High/Low clustering suggests that the distribution of pottery within Period 1 graves is random (z score =0.712 p=0.48).

Figure 28: Period 1 Pottery



In Period 2, only 3 (2%) burials contain pottery (Figure 29). This can be broken down into 2 females (730, 452) and one ambiguous individual (256). Grave 730 is isolated at the northwest end of the cemetery in Area D. Graves 452 and 256 are located in Area B. High/Low clustering suggests this distribution is random (z score =0.59 p=0.55).

Figure 29: Period 2 Pottery



For Period 1, Fisher's exact test did not find a significant difference in the presence of pottery between subadults and adults (p=0.5) or subadults and females (p=1). When the two periods are compared there are significant differences between Period 1 and Period 2 subadults (p=0.000025), adults (p=0.000002), and females (p=0.007). In Period 1, pottery does not appear to be related to age or sex but in Period 2, pottery appears to be associated with female burials.

Coins

Only three graves (1%) in the cemetery contain coins and the coins that were found had been used as jewelry in pendants and armlets (Table 40). In Period 1, grave 278 is the only grave with (3) coins (Figure 30). Unfortunately, no skeletal remains were recovered from this burial but the smaller size of the grave suggests it was for a child (Crummy et al., 1993). In Period 2, two graves, both located in the southeast corner of the cemetery, contained coins (Graves 15 and 18) (Figure 31). Grave 15 did not have skeletal remains but Grave 18 contained a male. Fisher's exact test did not find a significant difference in the presence of coins between Period 1 and Period 2 (p=1).

Table 40: Graves Containing Coins

	Period 1 N=60		**Period 2 N=153**		**Total Sample N=213**	
	n	**%**	**n**	**%**	**n**	**%**
0 coins	**59**	*98*	**151**	*99*	**210**	*98.5*
1 coin	**0**		**1**	*0.7*	**1**	*0.5*
2 coins	**0**		**1**	*0.7*	**1**	*0.5*
3 coins	**1**	*2*	**0**		**1**	*0.5*
Total graves w/coins	**1**	*2*	**2**	*1*	**3**	*1.4*

Figure 30: Coins in Period 1

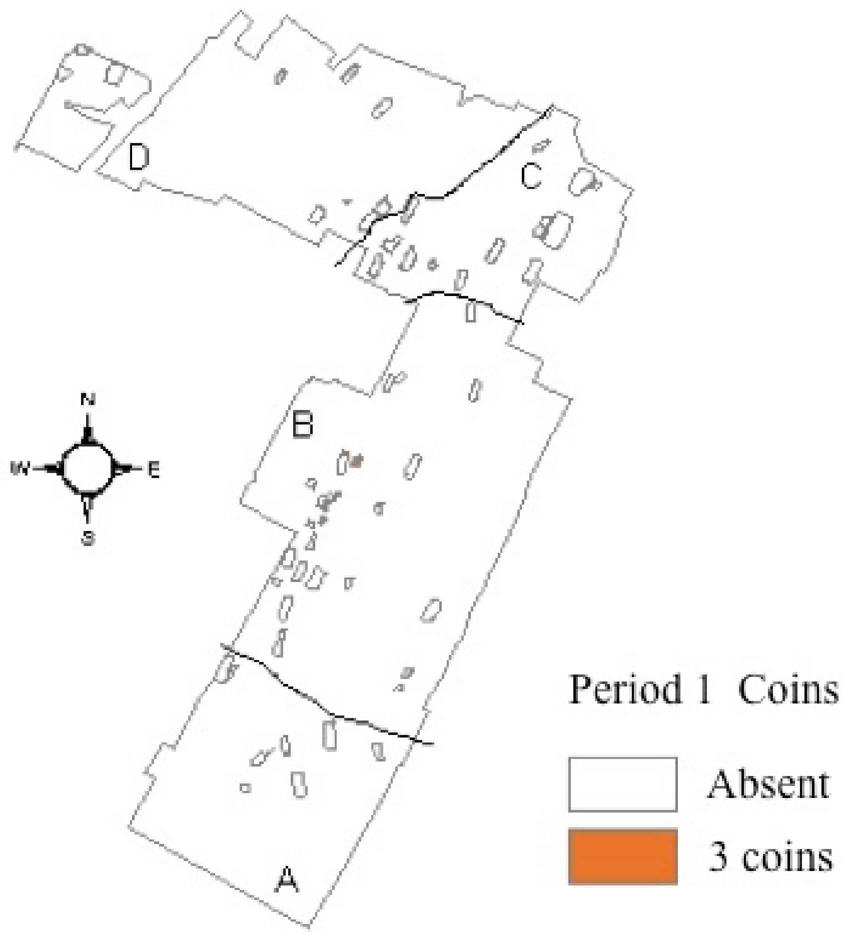
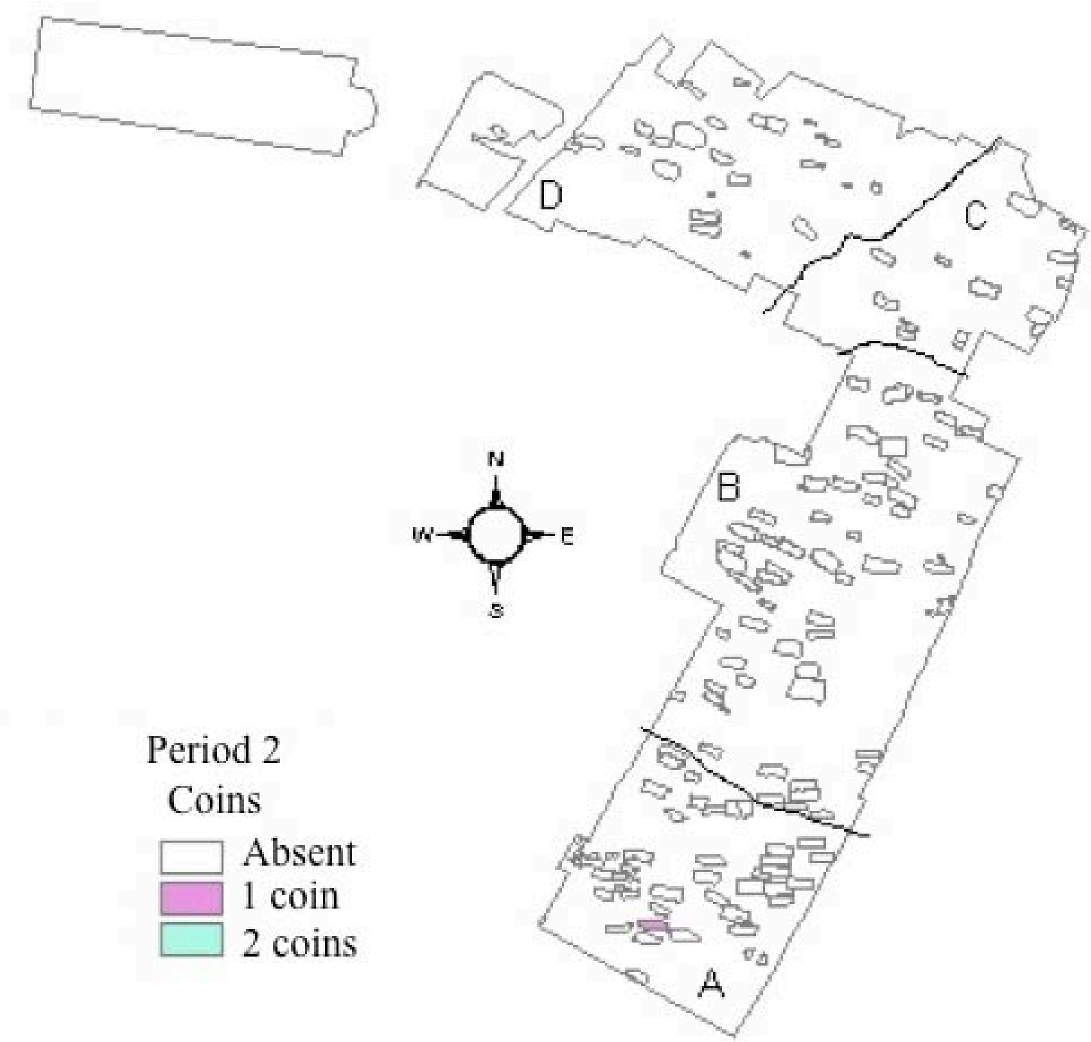


Figure 31: Coins in Period 2



Shoes/Hobnails

Hobnail shoe nails were recovered from 13 graves in the sample (Table 41). Period 1 has ten burials with evidence of shoes (16.67%) (Figure 32). Only two of the graves in Period 2 (2%) contain shoes (Figure 33). One of these burials contained a female, while the other contained only a few teeth.

Table 41: Graves Containing Hobnails/Shoes

	Period 1 N=60		**Period 2 N=153**		**Total N=213**	
	n	**%**	**n**	**%**	**n**	**%**
1 shoe only	**1**	*2*	**0**		**1**	*0.5*
1 pair of shoes	**11**	*18*	**2**	*1*	**13**	*6*
2 pairs of shoes	**1**	*2*	**0**		**1**	*0.5*
Total graves w/shoes	**13**	*22*	**2**	*1*	**15**	*7*

Evidence for only a single shoe was recovered from Grave 100, which had been heavily disturbed (no skeletal material was recovered from this grave). Only one grave (Grave 277) had evidence for two pairs of shoes that were located inside the coffin. One pair was crossed and not associated with the skeleton, while the location and orientation of the second pair is less certain due to the poor preservation of the burial.

A visual inspection suggests that four Period 1 burials with shoes do form a cluster (G554, 555, 533, 601). The other burials with shoes are more dispersed, though G100, G273, G274, and G277 appear to form a row. All the same, High/Low clustering analysis suggests this may be due to chance (z score = 1.13 p=0.26). In Period 2 the graves with shoes (G730 and G171) are at opposite ends of the cemetery and appear to be distributed randomly (z score = -0.18, p=0.86).

There is a significant difference in the presence of hobnails/shoes between Period 1 and Period 2 (p=0.00024). Unfortunately though, eight of the individuals in graves with hobnails in Period 1 could not be sexed. Of the rest, one female is buried with shoes, as well as one male, and one ambiguous individual. Only one subadult (aged 6-11 years) is buried with shoes. The other graves with shoes are poorly preserved adults or graves with little to no skeletal remains left.

Figure 32: Shoes/Hobnails in Period 1

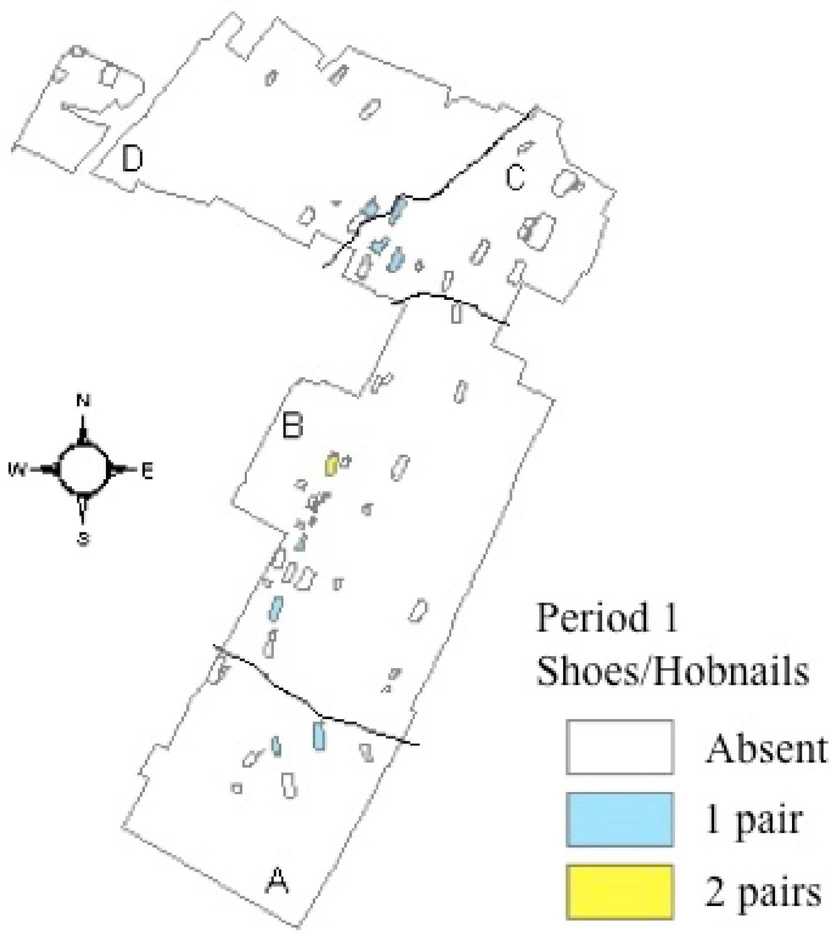
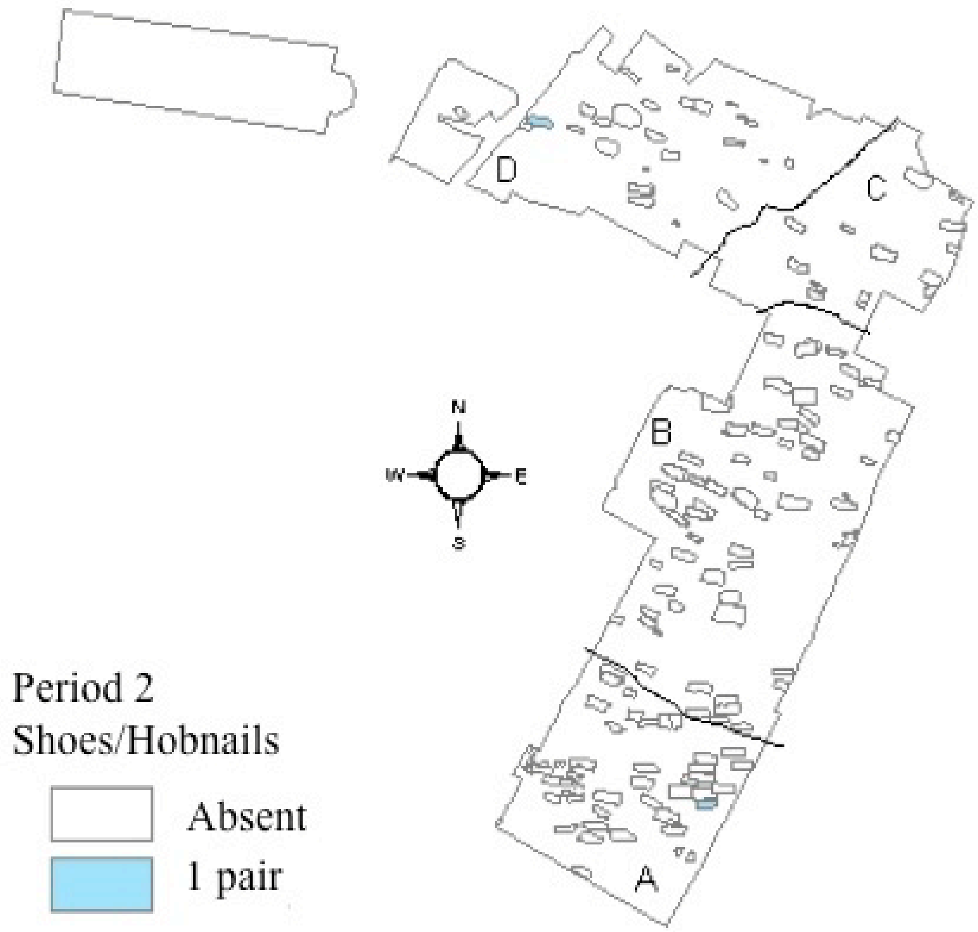


Figure 33: Shoes/Hobnails in Period 2



Combinations of Grave Goods

Burials containing a combination of grave goods are relatively rare in the cemetery. In Period 1 there are several different combinations of artifacts. Three graves have pottery and personal adornment items, four graves have pottery and footwear, one grave has glass and footwear, and one grave (Grave 693) has glass, pottery, footwear, and a pewter vessel. In Period 2, two graves have glass and personal adornment items and one grave has footwear and pottery.

Unique Grave Goods

There are several grave goods that occurred only once within the cemetery. In Period 2, Grave 171 was the only grave from which a knife was recovered. The knife appears to have been in a leather scabbard that was suspended by an iron chain (Crummy et al., 1993). In addition, Grave 171, which is part of the Period 2 grave cluster in the southeast corner of the cemetery, had hobnail shoes, a necklace of glass beads, copper rings, bone and copper armlets, and possibly textiles. This grave contained a poorly preserved young adult from which only teeth and fragments of bone were recovered so sex could not be determined.

Grave 70 from Period 1 also contained two writing styli inside the coffin as well as a pottery bowl outside of the coffin. This burial was for a subadult whose dentition suggests an age between 12-17 years.

Grave 693 in Period 1 contained the only pewter vessel found in the Butt Road cemetery. Grave 693 also contained a pottery cup, a glass bowl, and a glass flask. This grave is problematic because it contained the skeletal remains of two individuals, a female (6931) and a subadult (6932). The subadult (6932) appears to an earlier burial disturbed by the female (6931) but Crummy et al. (1993) suggest that the grave goods were associated with the female (6931) or possibly with G687, which cut into G693.

One Period 1 grave, (Grave 687) and four Period 2 graves (Graves 447, 171, 15, and 77) contained evidence for the presence of textiles. Notably, Grave 77 is said to have contained fragments of Chinese silk (Crummy et al., 1993).

Summary of Significant Mortuary Results

The analysis of the mortuary variables results in an interesting pattern of mortuary treatment over time at the Butt Road cemetery. There is a significant difference in head orientation between Period 1 and Period 2. There is also a significant difference in the presence of grave goods between Period 1 and Period 2. Period 1 adult males and females were more likely to be buried with grave goods than Period 2 adult males and females. It is interesting to note that more subadults in Period 2 were buried with grave goods than Period 1 subadults (although this is not significant statistically). There are significant differences in the amounts of pottery and footwear recovered in each time period. Period 1 graves contained more pottery and footwear than Period 2 graves. Also, Period 2 grave goods are more likely to be placed inside the coffin.

When the spatial distribution of mortuary variables is explored distinct differences appear between time periods. In Period 1, grave goods are randomly distributed through the cemetery but in Period 2, there are distinct and significant clusters of grave goods, specifically personal adornment items and glass vessels. Table 42 summarizes the results of high/low cluster analysis of mortuary variables within Period 1 and Period 2. The relationships between mortuary variables, demography, and stress indicators will be explored in the next section.

Table 42: Summary of High/Low Custer Analysis Results for Mortuary Variables[1]

High/Low Cluster Results				
Mortuary Variable	**Period 1**		**Period 2**	
Grave goods Present	z=1.07	p=0.28	z =2.48	p=0.01
Glass	z = -0.28	p=0.78	z = 6.42	p=0.00
Personal adornment items	z=2.01	p=0.05	z=1.68	p=0.09
Pottery	z =0.712	p=0.48	z = 0.59	p=0.55
Footwear	z= 1.13	p=0.26	z = -0.18	p=0.86

[1]Critical value z=1.96 p=0.05

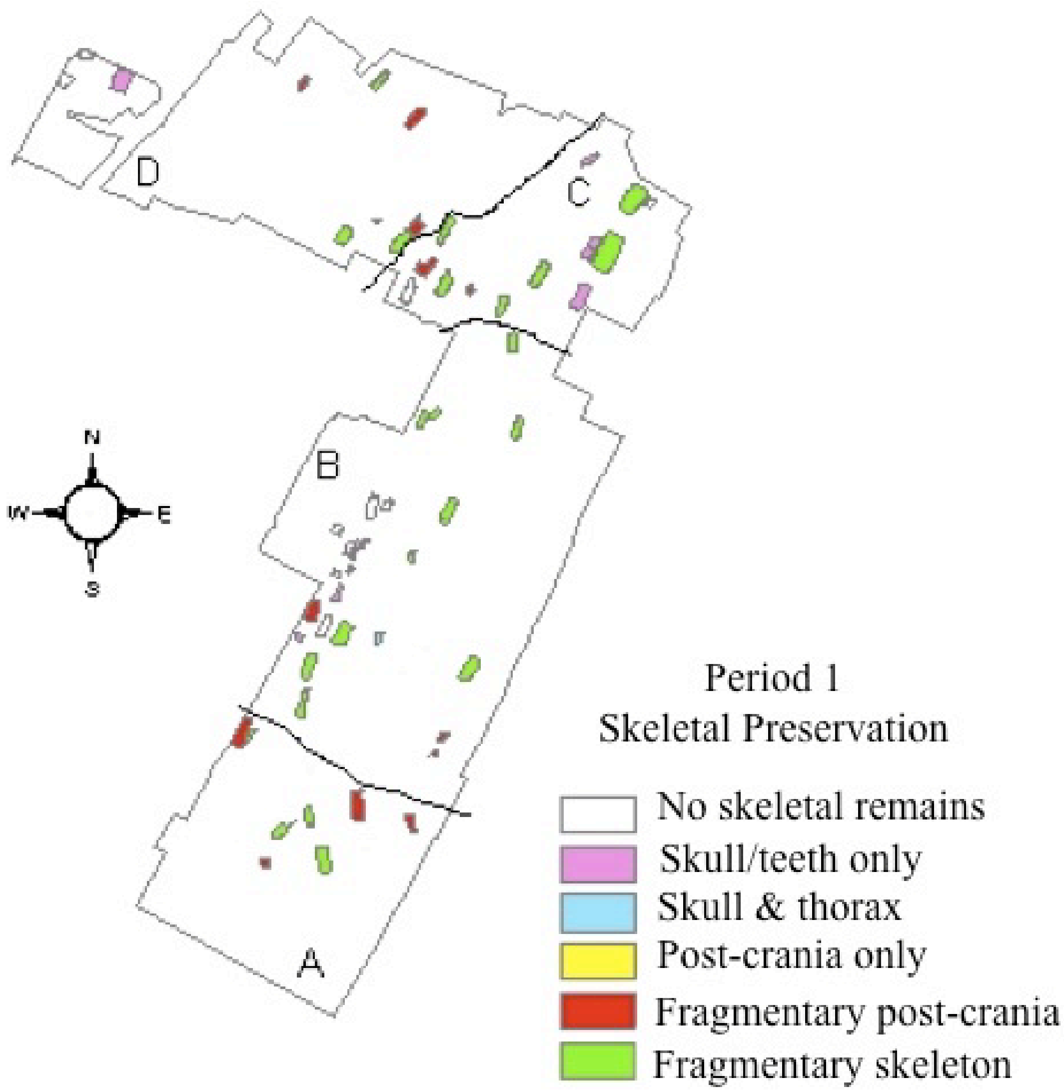
Description of Skeletal Demography and Stress Indicators

This section describes the spatial distribution of the skeletal samples from Period 1 and Period 2. It examines differences in preservation by cemetery area as well as the spatial distribution of the sample by age, sex, and skeletal stress indicator.

Preservation and Completeness of Skeletons by Area

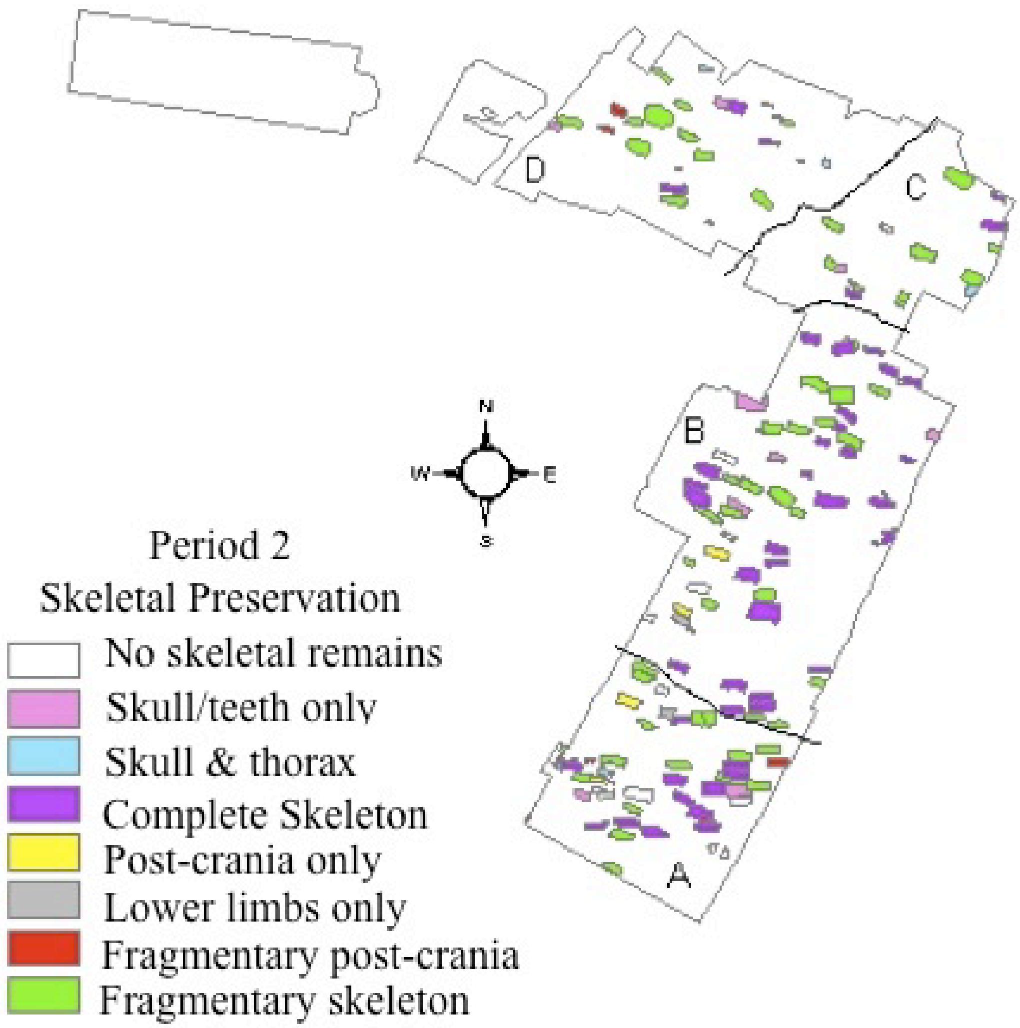
A majority of the Period 1 graves are disturbed by the creation of Period 2 burials. As a result, no complete skeletons were recovered from Period 1 (Figure 34). All the same, preservation is generally better in area A where both skull and post-cranial fragments were recovered. In area B, along the western edge of the cemetery, there are multiple graves with little or no skeletal material recovered.

Figure 34: Skeletal Preservation in Period 1



Although preservation is generally much better in Period 2, most of the complete skeletons come from areas A and B (Figure 35). This is likely due to the fact that Areas C and D were often disturbed by medieval and modern construction. There also appears to be a difference in soil between cemetery areas, as some of the skeletal material from areas C (near the border with D) and D has been stained black. It is unclear what caused the black staining but it does not occur in this sample in areas A and B.

Figure 35: Skeletal Preservation in Period 2



Demography Distribution

In Period 1, subadults are buried in all areas of the cemetery there is a trend for males to be buried mainly in the central portion of the cemetery and for females to be placed near its edges (Figure 36).

In Period 2, subadults seem to be located in small clusters of graves, especially in area B. Males seem to be concentrated in areas A and B while females were more evenly distributed in all four areas of the cemetery (Figure 37).

The excavators of the Butt Road cemetery have assumed that burial location is related to family relationships and marriage. In modern cemeteries husband and wives are frequently buried in close proximity to each other. However, when this sample is examined for males and females in close proximity (male-female graves adjoined on one side) there is no evidence for these types of burials in Period 1. As mentioned previously, Period 1 graves are poorly preserved so that few individuals could be confidently sexed but even the row distribution and overall orientation of the graves place fewer graves in “paired” positions so that no male-female pairs are identifiable. In Period 2, there are several male-female paired graves in area A (Graves 61&59, 155&148, 174 &173, 172&180, 11&18). Few male-female pairs are present in areas C and D, while in area B, there are two sets of paired graves with one individual assigned to the ambiguous category (Graves 266 ambiguous &453 female, 250 ambiguous &256 male). Based on the sample’s distribution of males and females, family groupings in this cemetery may not reflect modern expectations of male/female pairs reflecting marriage patterns. In the Butt Road cemetery, there do appear to be family or household groups buried near each other. However burial location appears to be related to order of death rather specific relationships between individuals.

Figure 36: Demographic Distribution in Period 1

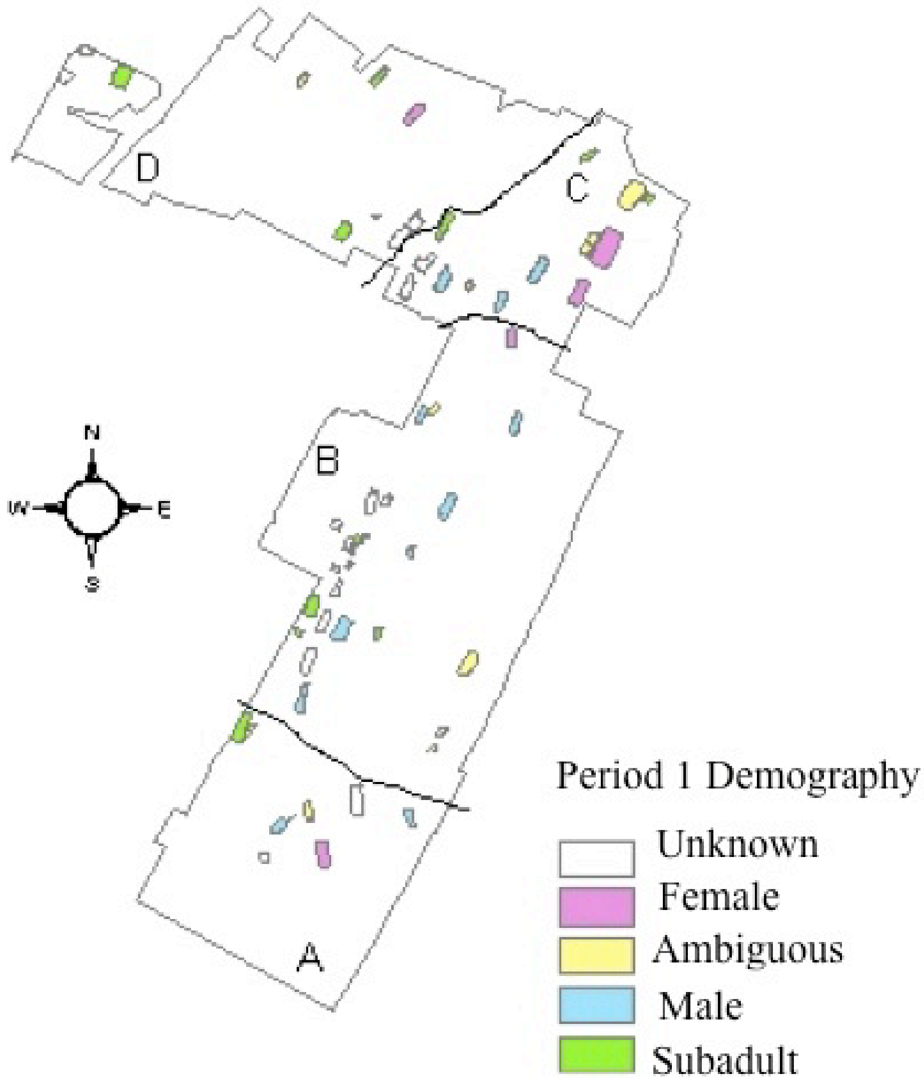
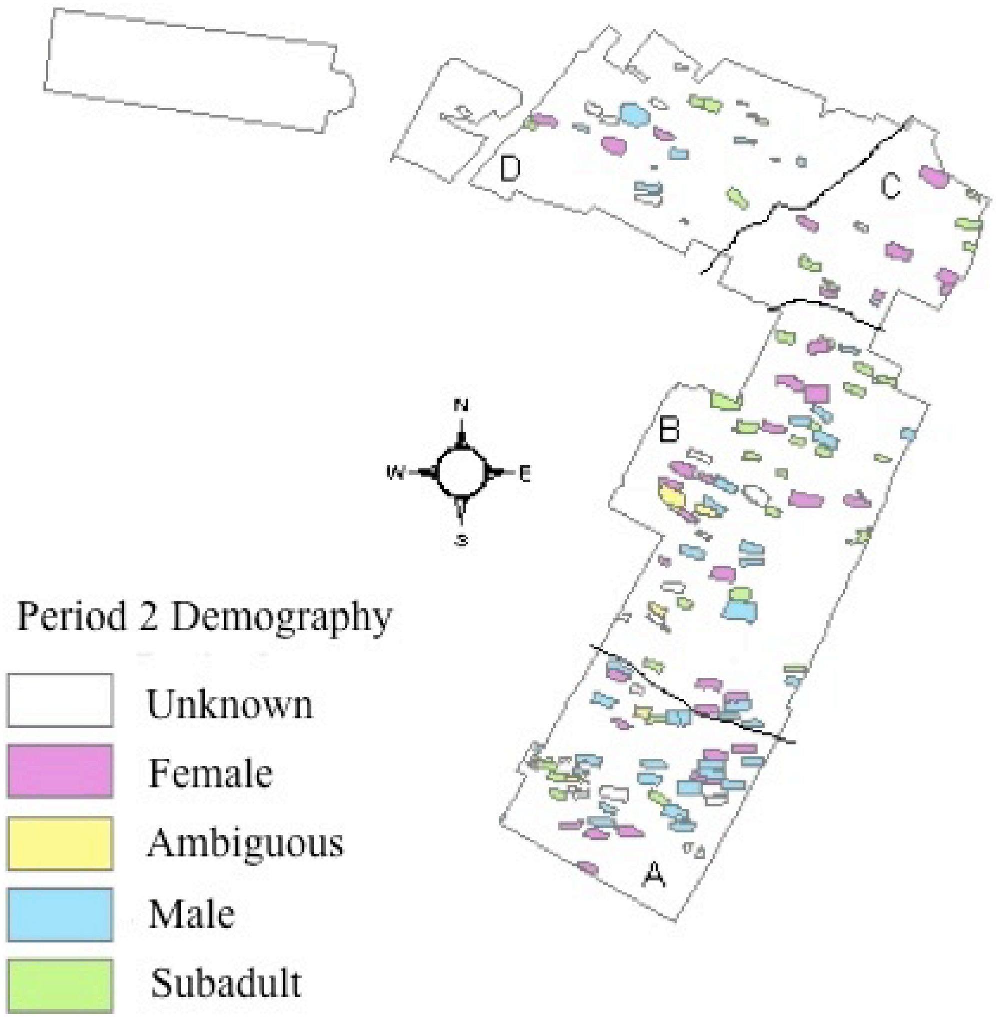


Figure 37: Demographic Distribution in Period 2



Distribution by Age

Subadults are sometimes concentrated in one area of Roman period cemeteries, such as the Yasmina Cemetery from Carthage (Norman, 2002; Norman, 2003), however this pattern is not apparent in the Butt Road cemetery for Period 1 (Figures 38 and 39).

The subadult sample in Period 1 is very small. There are no infants and some subadults could not be assigned an age range. However, subadults are widely dispersed throughout the cemetery, occurring in all four areas of the cemetery.

In Period 2 there do seem to be more groupings of subadult burials, especially in area B. Visual inspection suggests that infants (birth to 1yr) and young children (2-5 years) are concentrated in area B. Older children and adolescents appear are more equally distributed to all four areas of the cemetery. The concentration of infants and young children in area B is interesting. These subadult burials occur in regular cemetery rows and are not distinctly separated from adults. This burial pattern is more integrated than the burial pattern described by Norman (2002 and 2003) in Carthage. However, it does suggest a preference for grouping children near each other if possible.

Figure 38: Subadults by Age in Period 1

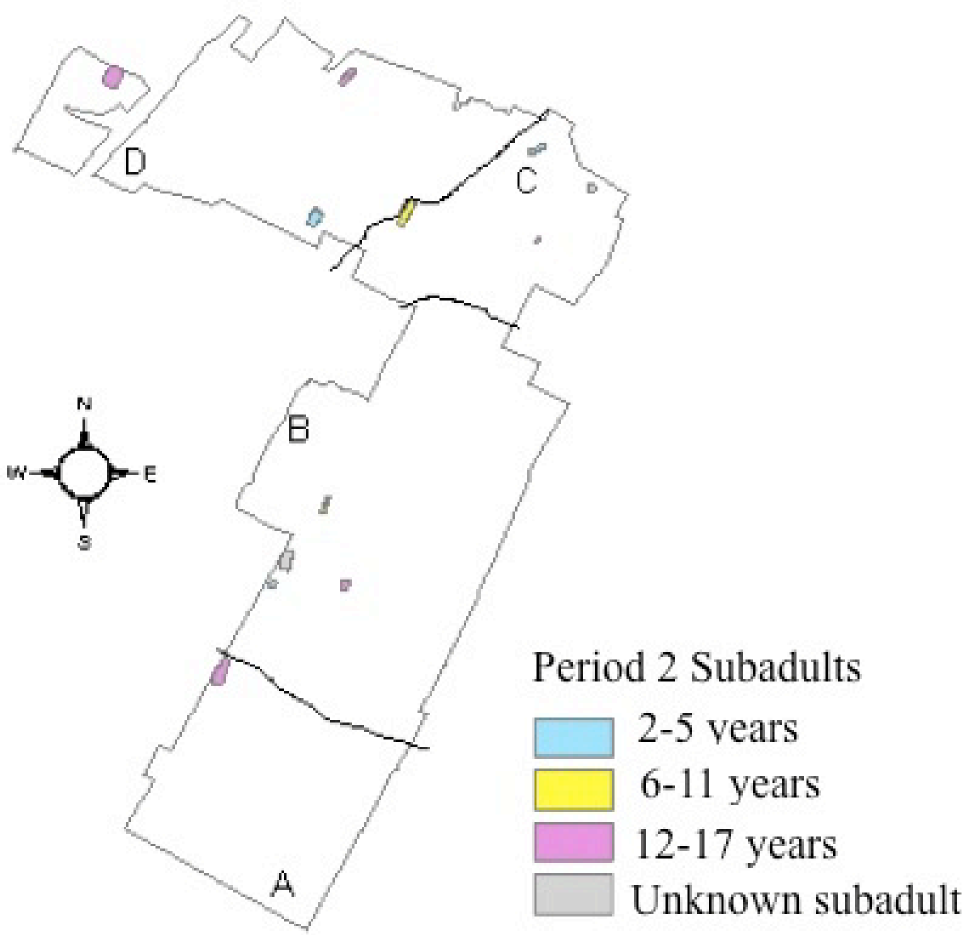
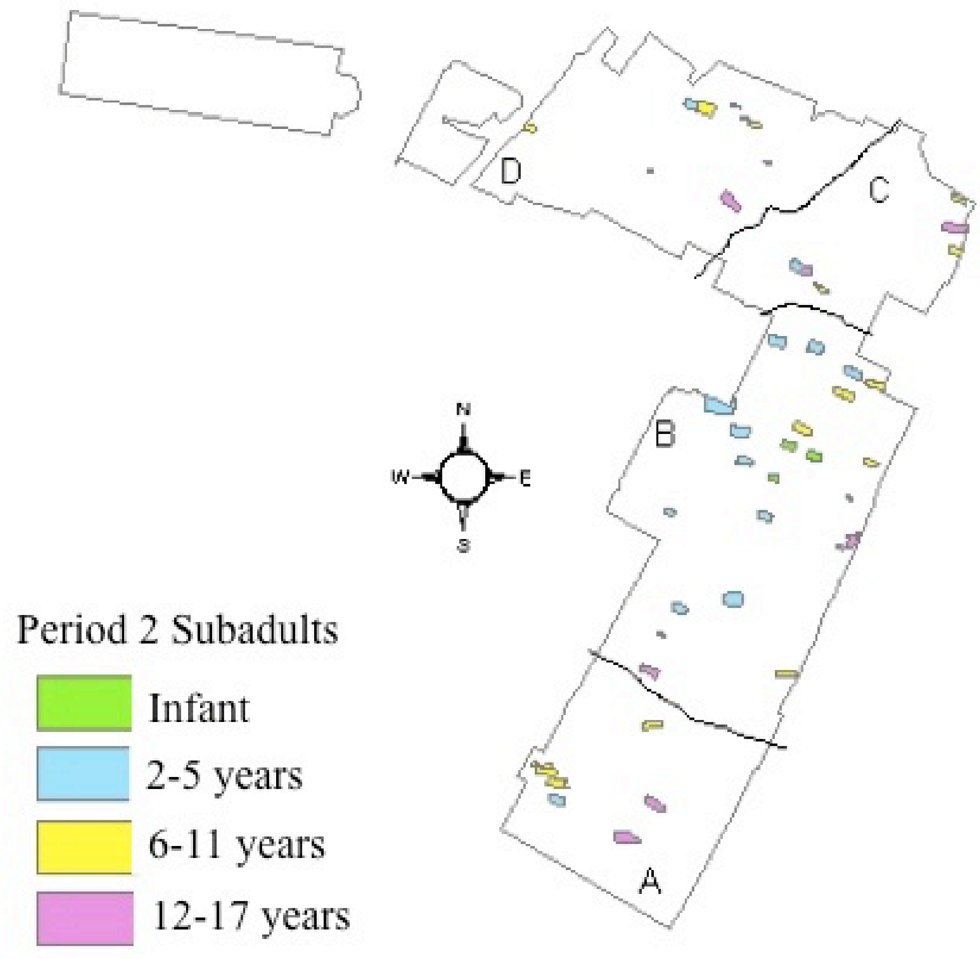


Figure 39: Subadults by Age in Period 2



Adults by Age

There does not appear to be much of a pattern for adult burials with respect to age in Period 1 (Figure 40). Preservation was poor along the edge of area B so that the burials there could not be aged. Middle age adults and young adults are concentrated in area C, but this concentration is likely due to preservation inasmuch as graves outside this area could not be aged or could only be recognized as being adults. In Period 2, preservation is better in areas A and B. This is likely why the young and old adults seem to be concentrated in these areas (Figure 41).

Middle age adults and unknown adults are distributed more evenly throughout all areas of the cemetery. High/Low clustering indicates that the distribution of ages within the cemetery is fairly random in both Period 1(z score= -0.54 p=0.59) and Period 2 (z score = 1.21 p=0.22).

Figure 40: Adults by Age in Period 1

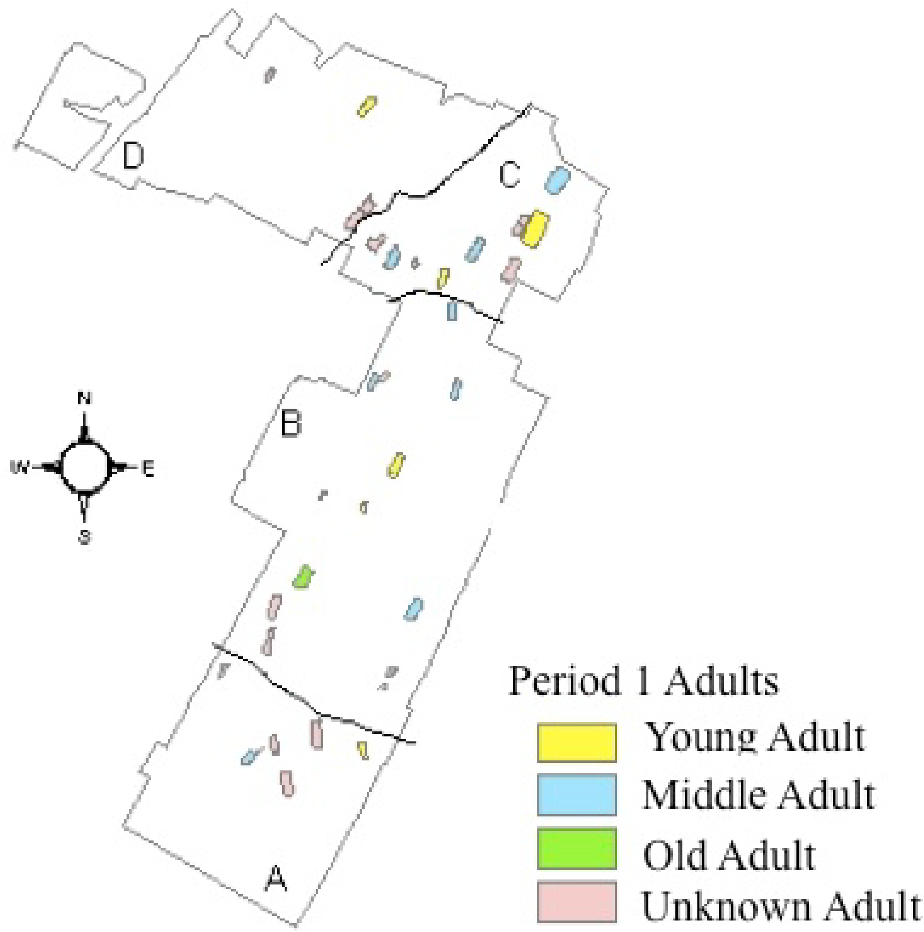
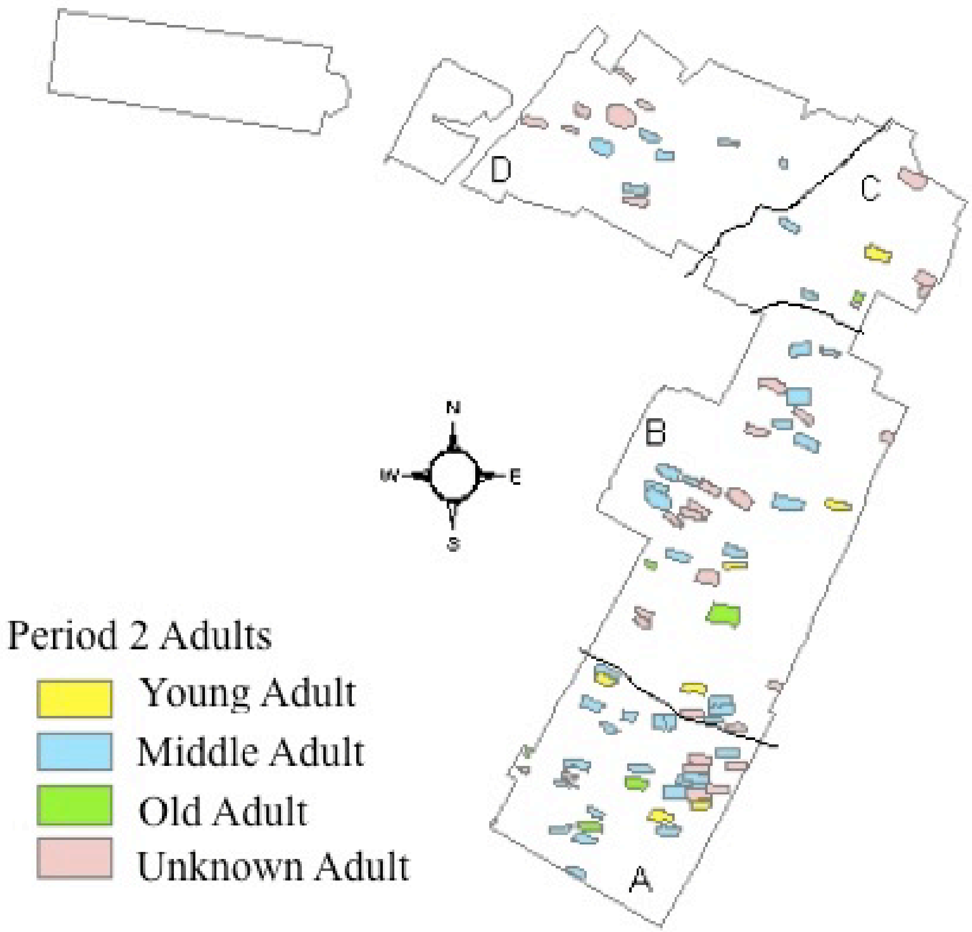


Figure 21: Adults by Age in Period 2



Distribution of Skeletal Stress Indictors

Linear Enamel Hypoplasias (LEH)

In Period 1, 11 (52.4%) individuals have LEHs present but they do not form any type of cluster (Figure 42). High/Low clustering in Period 1 indicates that individuals without LEHs may be clustered but that this could also be random (z score = -1.47 p=0.14).

In Period 2, 31 (37.8%) individuals were observed with LEHs (Figure 43). There does seem to be slightly more grouping in Period 2 although LEHs occur in all areas of the cemetery. Many of the individuals with LEHs in this sample occur in area A. There seem to be clusters, (Graves 128, 31, 35 and Graves 189, 160, 148) as well as several pairs of affected individuals (Graves 173 and 174, (61 and 59, and 21 and 22. However, high/low clustering indicates the distribution of LEHs in Period 2 is random (z score = 0.79 p=0.43).

Fisher's exact test is used to test the association between LEHs and grave good presence. In Period 1, so there appears to be no association between the presence of LEHs and the presence of grave goods (p = 0.59). In Period 2, for all individuals, the results suggest that there may be some kind of relationship between the presence of LEHs and grave goods (p=0.09). When the presence of grave goods and LEHs is broken down into categories for subadults, males, and females, there is no clear association between the two variables (subadults p=0.4, Females p = 0.2, Males p= 0 .5.)

Figure 42: Linear Enamel Hypoplasias in Period 1

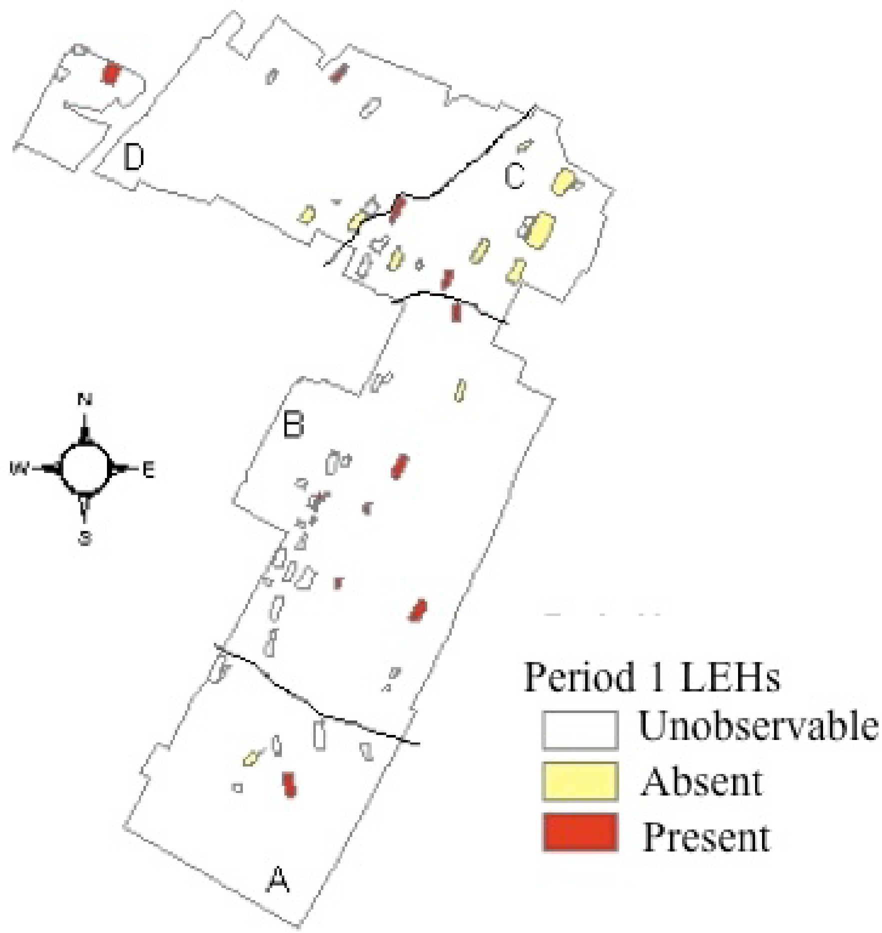
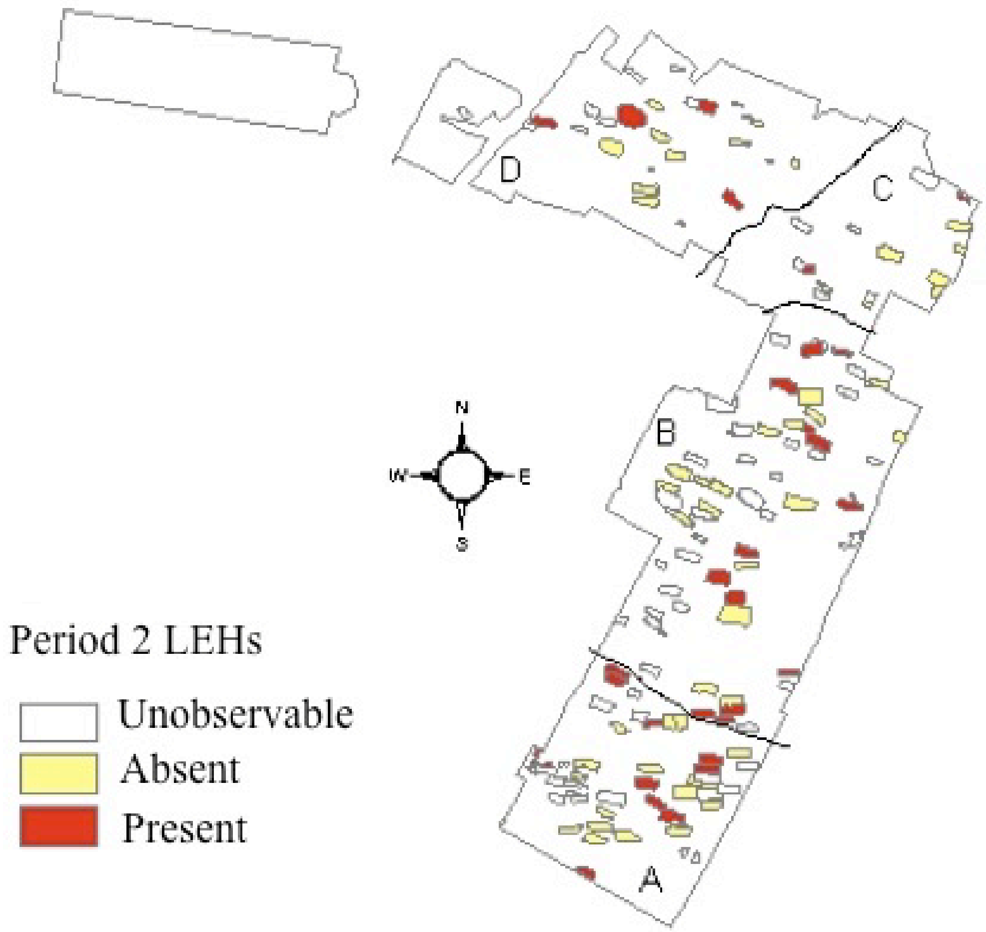


Figure 43: Linear Enamel Hypoplasias in Period 2



Cribra Orbitalia

There does not appear to be any spatial relationships present for individuals with cribra orbitalia in Period 1. There are only two cases for Period 1 (Graves 324 and 447) and these are at opposite edges of the cemetery (Figure 44). In Period 2, individuals with cribra orbitalia occur in all areas of the cemetery but areas B and C have the highest concentrations of affected individuals (Figure 45). This distribution is probably related to the preference for burying subadults in these areas. Cribra orbitalia rarely affects adults in this sample, so a majority of the individuals with cribra orbitalia are subadults. Preservation and the sampling strategy used may also affect the distribution. Visual inspection suggests a possible cluster of three graves along the border of area C and area B (Grave 378, 347, and 359) is interesting. These graves contained subadults, two of which were between the ages of 2-5 years and one between 6-11 years. However, High/Low clustering indicates the distribution of individuals in both Period 1 and Period 2 is random (Period 1 z score = -0.92 p=0.36; Period 2 z score = -1.10, p=0.27).

Because it is often assumed that the presence of and quality of grave goods is an indication of differences in social status between individuals, any significant differences in the presence of cribra orbitalia between individuals with grave goods and those without grave goods may indicate differential access to a high quality diet. Therefore, Pearson's Chi Square and Fisher's exact test at the p=0.05 level are calculated using SPSS to evaluate if there is an association between cribra orbitalia and the presence of grave goods.

In Period 1, Fisher's exact test (p=0.669) suggests that there is no connection between the presence of cribra orbitalia and the presence of grave goods.

In Period 2, Fisher's exact test results in a p = 0.019 which is significant at the p=0.05 level for all individuals in the sample. However this appears to be heavily influenced by the subadults in the sample. There is no significant difference between females with cribra orbitalia and grave goods (p=0.8). Males and ambiguous individuals also do not have an association between the presence of grave goods and cribra orbitalia. However, for subadults, there is a significant difference between individuals with cribra orbitalia and grave goods present and subadults buried without grave goods (p=0.0498). In this sample, 75% of subadults with grave goods also displayed evidence of cribra orbitalia while only 50% of subadults buried without grave goods also displayed evidence of cribra orbitalia.

This outcome is opposite of what one might expect if we assume that individuals with grave goods have higher status and perhaps better access to nutritious diet than individuals buried without grave goods. Higher social status may not have protected individuals from dietary stress or may have created new stresses by promoting unhealthy food choices as a means to express economic or political status (Van der Veen, 2003).

Figure 44: Cribra Orbitalia in Period 1

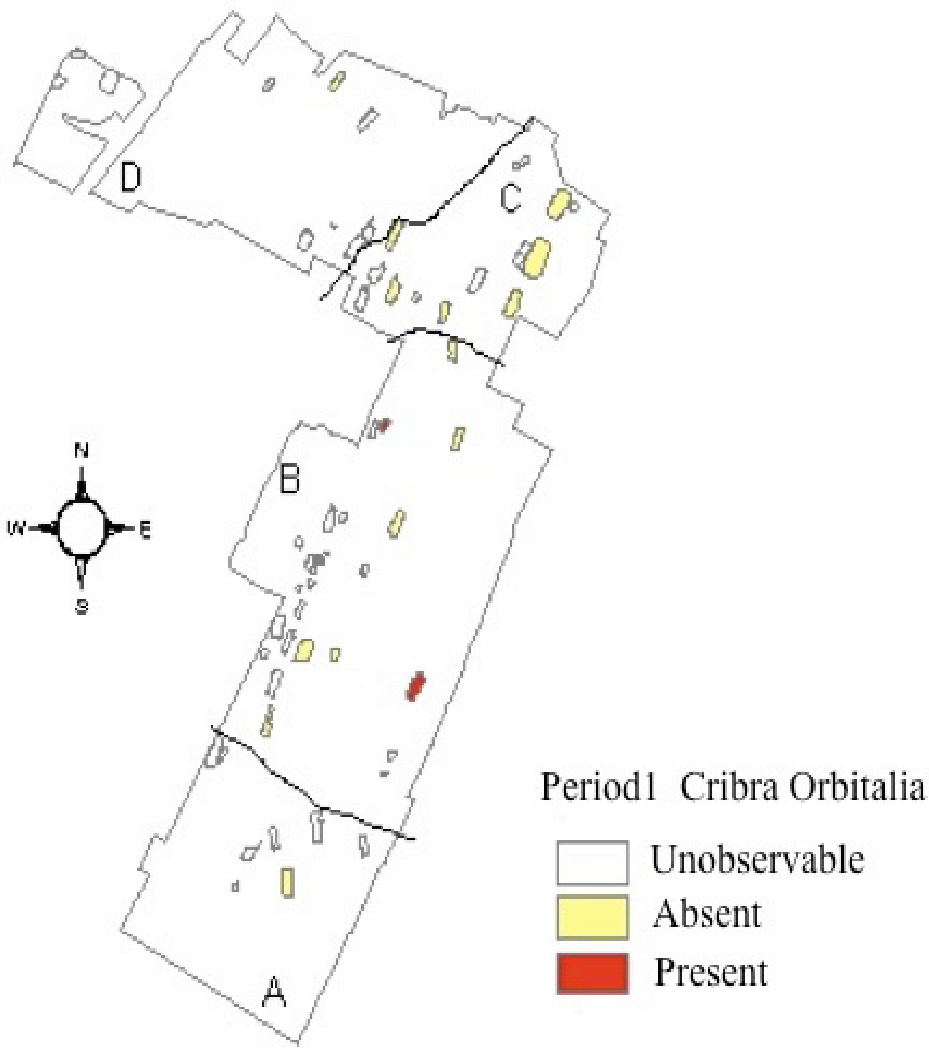
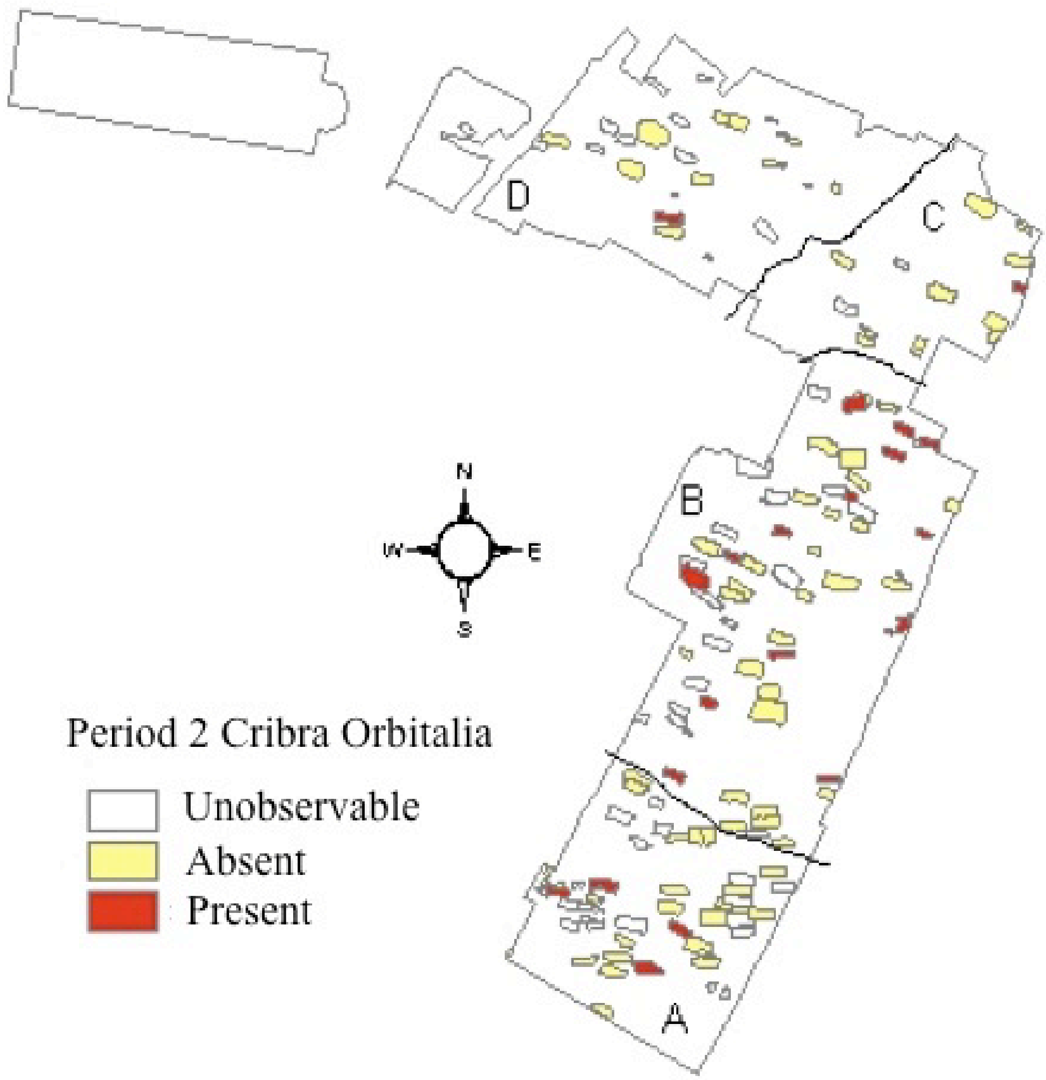


Figure 45: Cribra orbitalia in Period 2



Periostitis

Only two cases of periostitis were present in Period 1 (Graves 324 and 197) and there is no significant spatial relationship between these graves (Figure 46). Grave 324 is located at the eastern edge of the cemetery and Grave 197 is on the western edge of the cemetery. In Period 2, all of the individuals with periostitis are located in areas A and B (Figure 47). The only individual with periostitis in area D also had a fracture in the same bone so the infection was likely related to the fracture. Preservation was generally better in areas A and B of the cemetery so this likely explains the concentration of periostitis cases in these areas. There are no clusters of individuals with periostitis or even paired burials. High/Low clustering indicates the distribution of periostitis is random in both periods of the cemetery (Period 1 z score = -1.19 p = 0.23, Period 2 z score =0.47 p=0.64).

Fisher's exact test found no association between periostitis and grave goods in Period 1 (p=0.25) or in Period 2 (p=0.32). The erosion of the cortical surface made it very difficult to identify periostitis in Period 1 and this may have had an effect on these results. In Period 2, males have the highest levels of periostitis and were the least likely to be buried with grave goods. It is difficult to look at the relationship between status and periostitis in males in Period 2 because there are very few differences in mortuary treatments of males in the sample.

Figure 46: Periostitis in Period 1

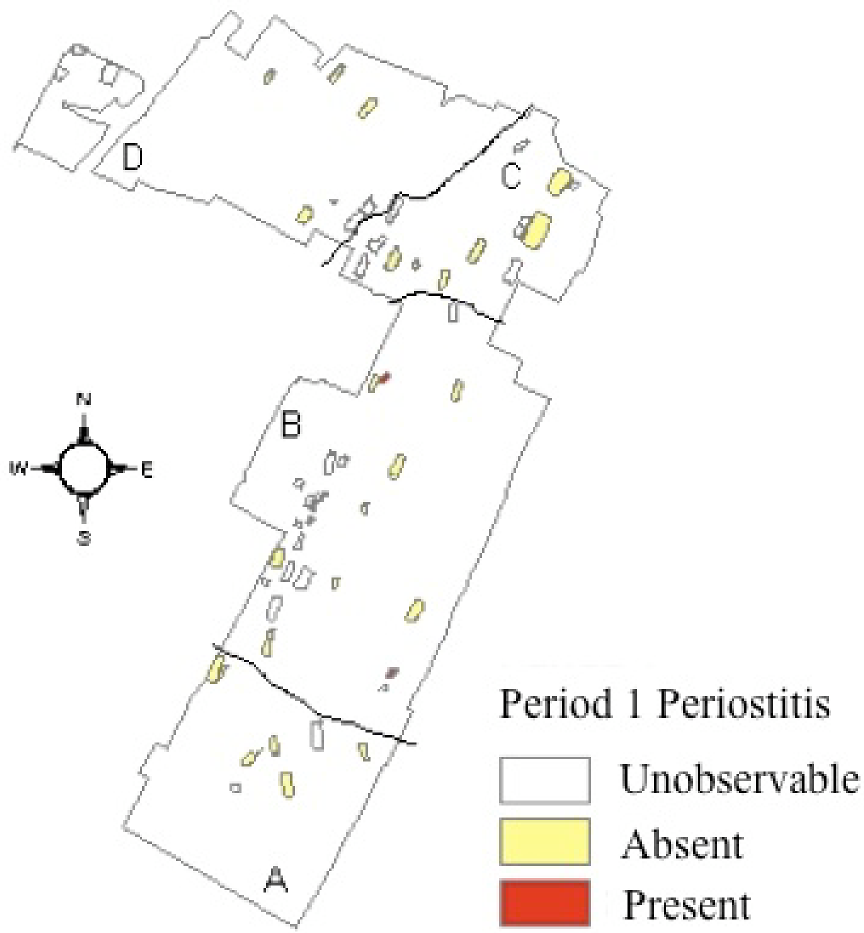
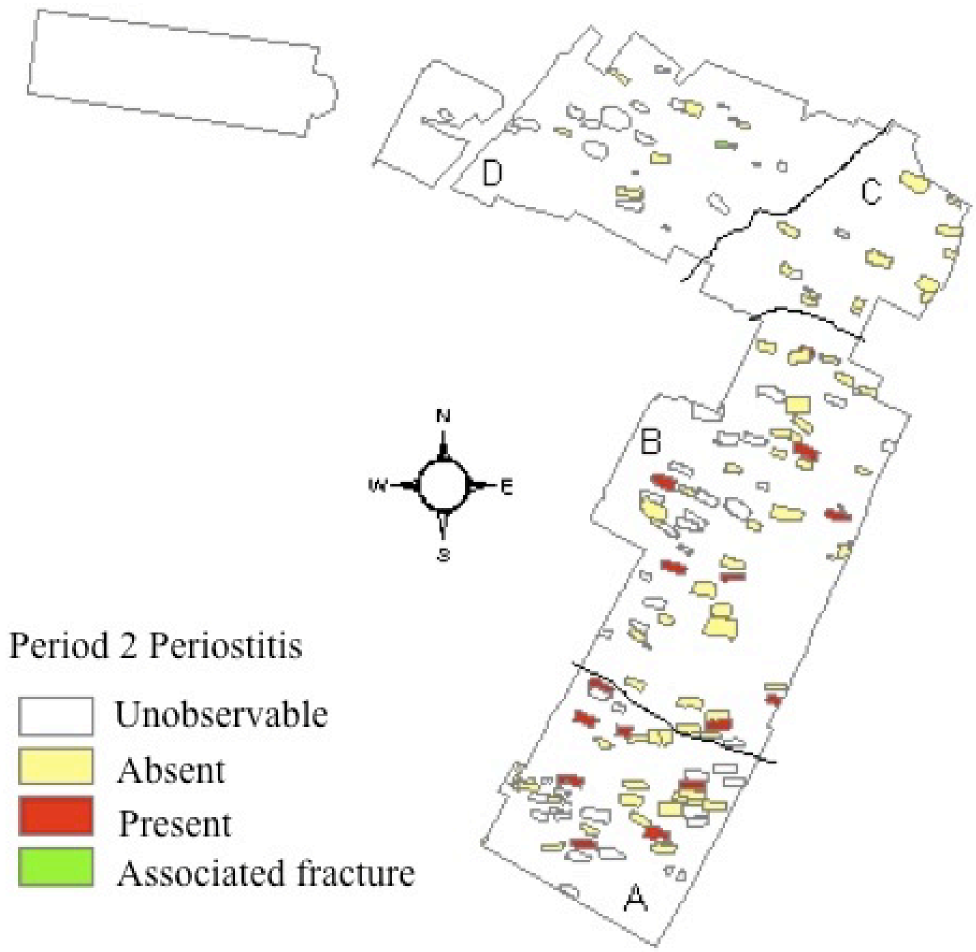


Figure 47: Periostitis in Period 2



Maxillary Sinusitis

Sinusitis occurs in both periods of the cemetery. In Period 1, six individuals had evidence for infection in the maxillary sinus (Figure 48). These individuals were evenly distributed throughout the Period 1cemetery, with no clusters or paired graves (High/Low clustering z score= -0.56 p=0.57). Poor preservation in Period 1 likely played a role in the distribution. No individuals along the west edge of the cemetery were observable for sinusitis. In Period 2, there is a heavier concentration of individuals with sinusitis in areas A and B (Figure

49). There is one visible cluster (graves 4, 11, 18, 50, and 27) in area A. Other individuals with sinusitis were buried in the same rows, although their graves do not intersect. For example, Graves 733 and 735 are part of the same row of graves. This is also somewhat true of Graves 414, 342, and 344. However High/Low clustering indicates the distribution of individuals with maxillary sinusitis within Period 2 is random (z score 0.22 p=0.83).

Fisher's exact test is used to test for association between grave goods and sinusitis. In Period 1, p=0.56 and in Period 2 p=0.25. There does not seem to be an association between the presence of grave goods and sinusitis in these samples.

Figure 48: Maxillary Sinusitis in Period 1

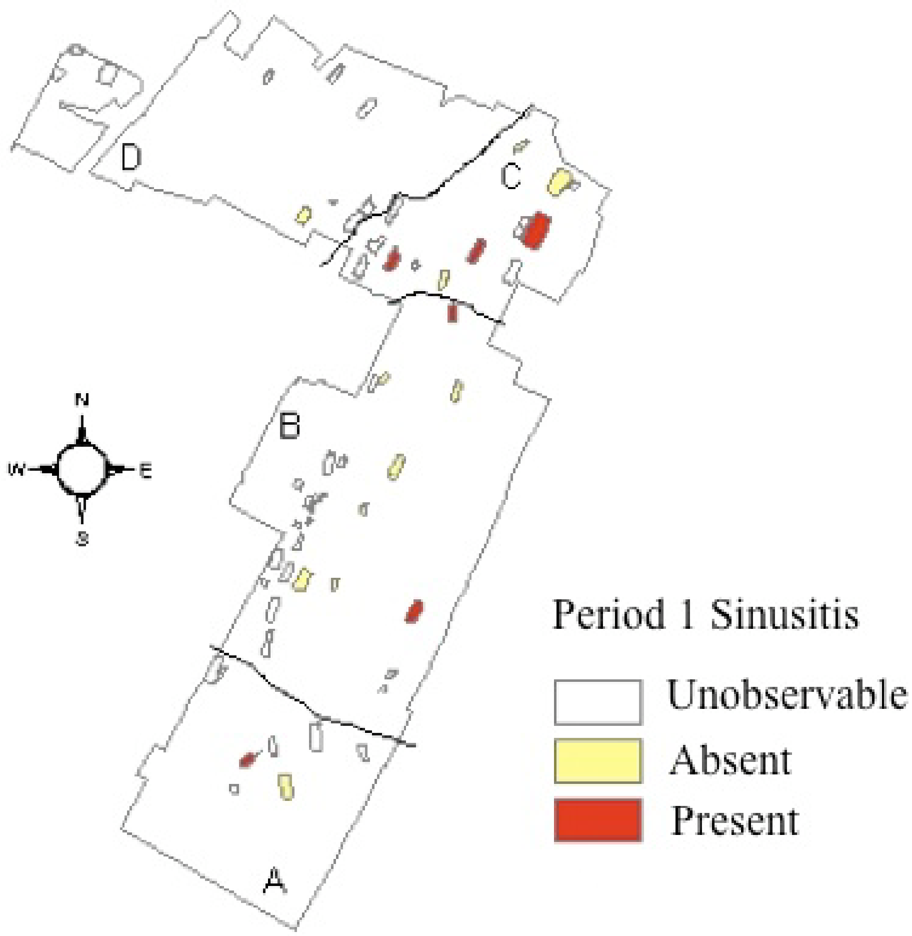
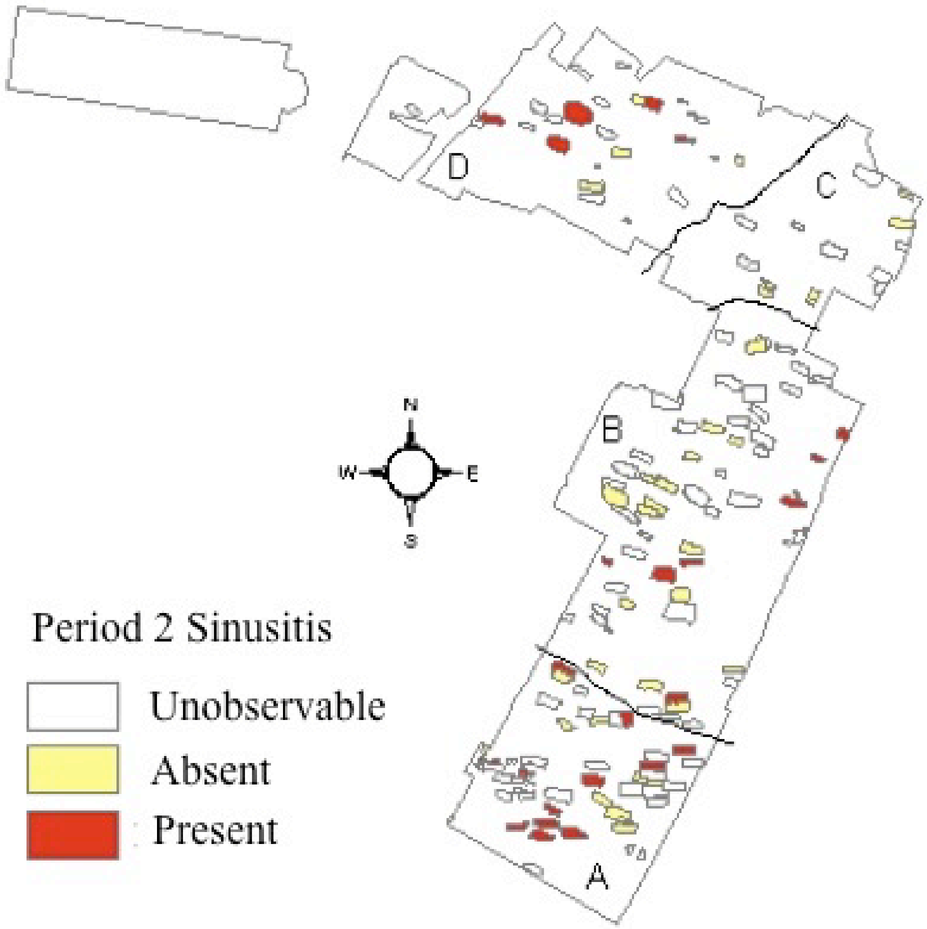


Figure 49: Maxillary Sinusitis in Period 2



Summary of Spatial Results of the Skeletal Analysis

The distribution of age and sex within the cemetery is random in both Period 1 and Period 2. High/Low clustering indicates that the distribution of skeletal health indicators within the cemetery is random (Table 43). Based on these results, skeletal health appears to have little association with grave goods. The only indicator that may be linked is cribra orbitalia in subadults. Subadults with grave goods appear to be more likely to have cribra orbitalia than those buried without grave goods. However this counterintuitive association is based upon a very small sample so this difference may be due to sample size than an actual difference in the way these individuals were treated in life.

Table 43: Summary of High/Low Cluster Analysis Results for Skeletal Variables[1]

High/Low Cluster Results				
Skeletal Variable	**Period 1**		**Period 2**	
Sex	z = -1.57	p=0.12	z =-0.16	p=0.87
Age	z = -0.54	p= 0.59	z = 1.21	p=0.22
LEH	z = -1.47	p=0.14	z= 0.79	p=0.43
Cribra Orbitalia	z = -0.92	p=0.36	z = -1.10	p=0.27
Periostitis	z = -1.19	p=0.23	z = 0.47	p=0.64
Sinusitis	z =-0.56	p=0.57	z = 0.22	p=0.83

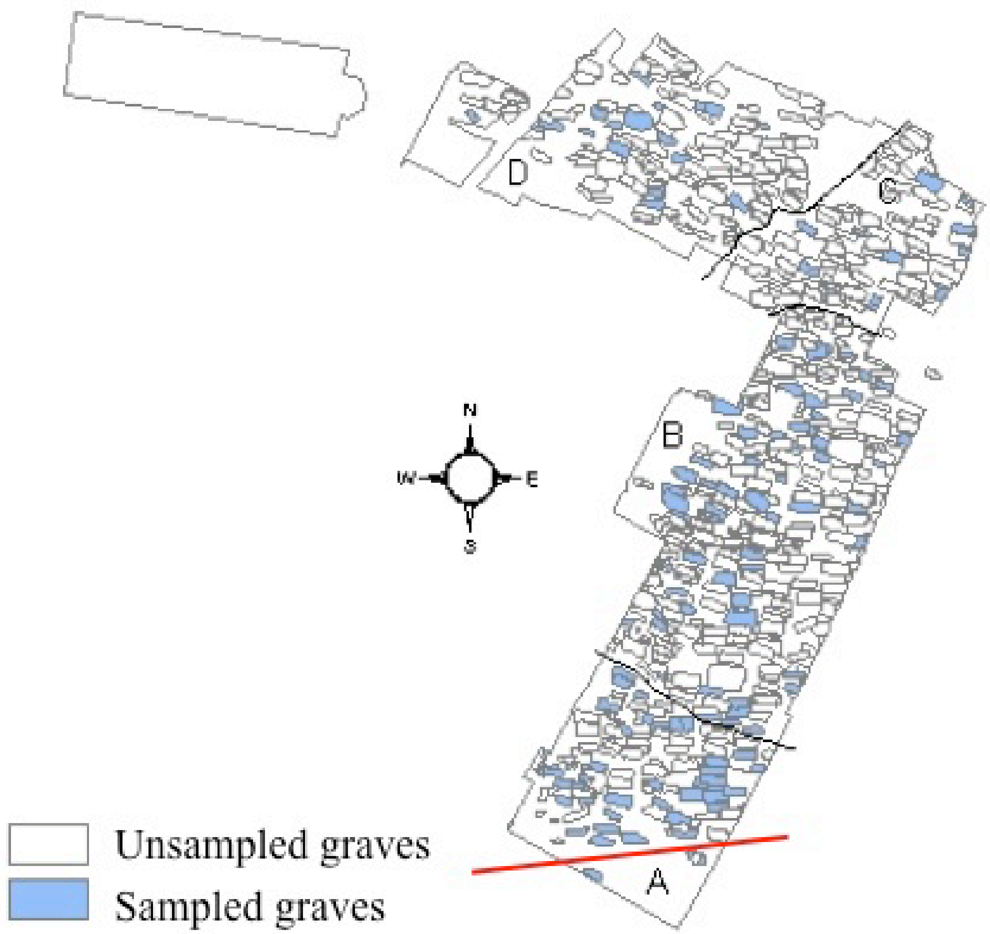
[1]Critical value z=1.96 p=0.05

Comparing and Contrasting Burials: Typical vs. Atypical

The results in the previous section indicate that the Butt Road cemetery has relatively little variation in burial treatments. Overall a 'typical' grave contained a single individual inhumed in an extended supine position in a nailed timber coffin (Crummy et al., 1993). Cremations are atypical in the Butt Road cemetery. While there is very little variation among most graves, there are several atypical burials within the cemetery. The presence of three of these atypical burials in area A has led the excavators of the cemetery to suggest that a boundary existed at the south edge of the cemetery. It is unclear if this was a physical boundary but the different characteristics of these particular examples suggests that there may have been a socially recognized distinction made between graves in this area and those within the main portion of the cemetery. Figure 50 indicates the possible division within area A. To the south of this boundary are several atypical graves that appear to be contemporaneous with the rest of Period 2. Graves

41/43, 51, and three graves excavated in 1997 lie to the south of this boundary (Crummy et al., 1993; Benfield; 1997).

Figure 50: Division between Typical and Atypical Burials in Period 2[1]



[1]The red line indicates a possible boundary between the main cemetery and atypical burials.

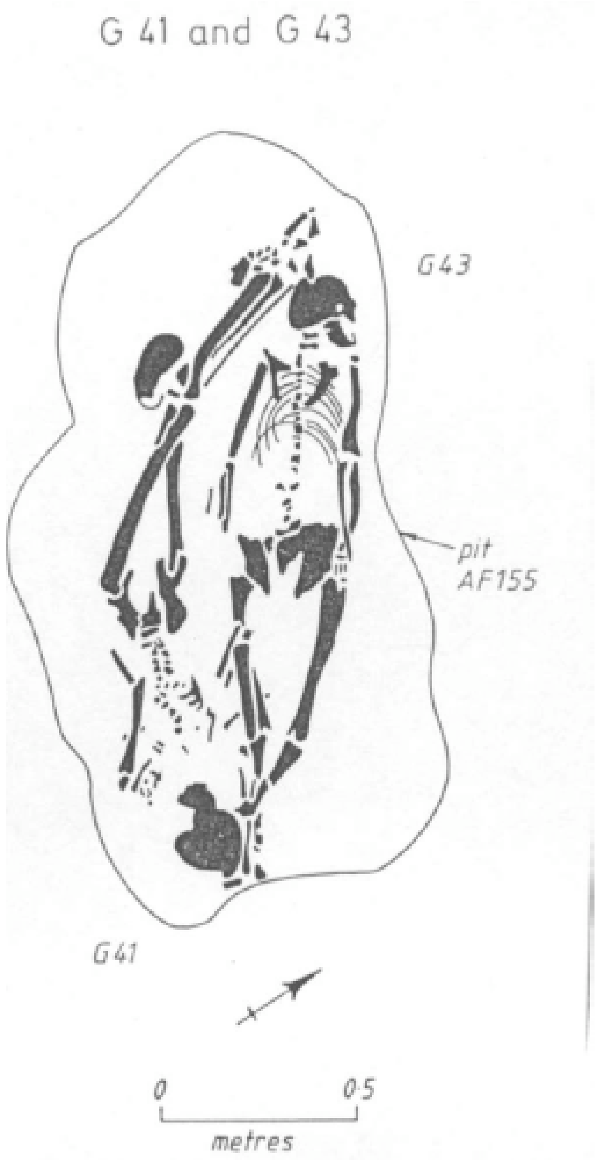
The individuals in these atypical graves appear to have been purposely placed outside the boundaries of 'normal society'. There are several possible explanations for this placement. Criminals, religious outcasts, and people accused of witchcraft may be buried apart from the rest of the community (Duncan, 2005).

Graves 41/43 and 51 are oriented east-west but are the only two graves with individuals buried with their heads to the east in the entire cemetery. These were pit burials without coffins so the head placement seems to be intentional rather than accidental. Another burial south of the boundary, discovered in the 1997 excavation, contained an adult male that had been decapitated (Benfield, 1997). This individual is the only decapitation discovered in association with the Butt Road cemetery and is the only individual with such violent trauma.

Grave 41/43 is also unique because it is a double burial (Figure 51). However, multiple individuals are found in several different burial contexts, including 'pit' burials, such as Graves 41/43, shared grave cuts such as Grave 121A/B, and secondary burial deposits such as Grave 694. Several other graves show evidence of accidental comingling due to disturbance of earlier graves but Graves 41/43, 121A/B, and 694 indicate intentional placement of multiple individuals in the same grave, which is atypical in this cemetery.

Grave 41/43 contained two middle-aged males, buried head to feet and an adolescent skull (Figure 51). The male in Grave 41 was buried with his head oriented east and at his knees was the skull of an adolescent. The burial description notes that the skull was at a lower level so it seems possible G41 disturbed an earlier burial. G43 is a middle aged male with the head oriented to the west. There was no evidence of coffins for these three individuals. The pit burial suggests that G41 and G43 were interred at the same time and may have disturbed an earlier burial (Crummy et al., 1993).

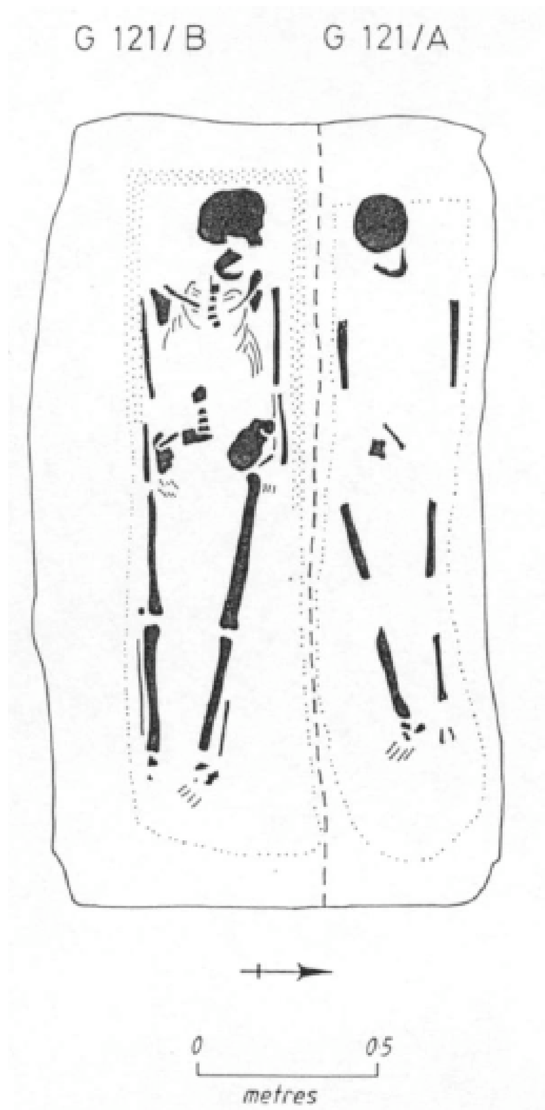
Figure 51: Burial Description of Grave 41/43[1]



[1]Crummy et al., (1993):fiche 338

Another atypical grave within the cemetery, Grave 121 contains two middle-aged males, both have their heads oriented to the west but who appear to share the same grave cut. (Figure 52) and were buried in nailed timber coffins without grave goods. The relationship between these two burials is uncertain but they appear to have been buried at the same time. Most individuals in the cemetery are buried within individual grave cuts so two individuals sharing a grave cut as atypical for this cemetery.

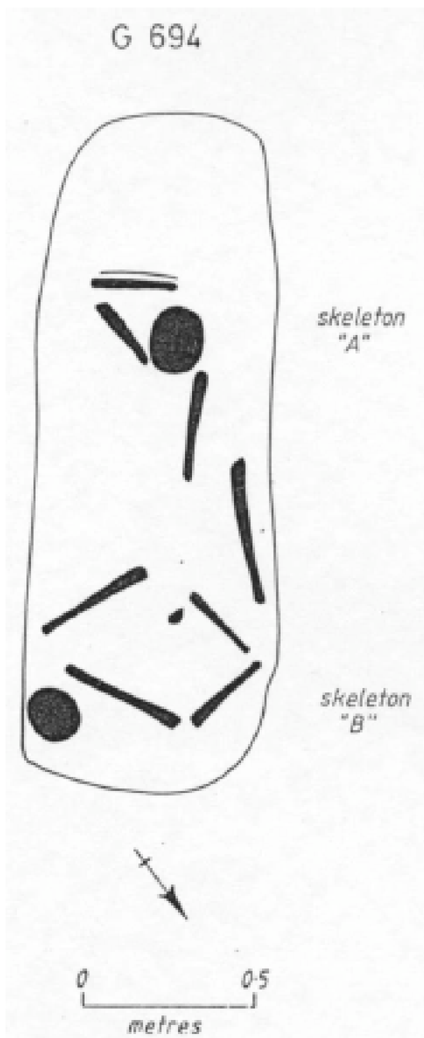
Figure 52: Burial Description of Grave 121 A/B[1]



[1]Crummy et al,. 1993: fiche 407

Grave 694, another type of atypical grave within the Butt Road cemetery, contains two individuals (Figure 53). 6941 (694A) is located at the south end of the grave, while 6942 (694B) is at the north end of the grave. Both sets of remains consist of skull and a few long bone fragments so sex could not be determined. However, they appear to be secondary burials that were either the result of grave disturbance from previous graves or interred as 'bundle' type burials due to other unknown circumstances.

Figure 53: Burial Description of Grave 694[1]



[1]Crummy et al., 1993:Fiche 929

Identifying Religious Belief through Burial Practice

Can Christian burials be distinguished from non-Christian burials in the fourth century AD?

Several authors have suggested that Period 2 of the Butt Road cemetery is an Early Christian cemetery (Watts, 1991, Crummy et al., 1993). The next section will explore Watts (1991) criteria for identifying Christian cemeteries based on the reanalysis from this study and more recent archaeological and textual evidence.

Watts (1991) developed criteria to identify Christian cemeteries in Britain for the fourth century AD. However, as burial practices are reconsidered from an archaeological standpoint and from the reinterpretation of texts, epigraphy, and imagery, scholars are beginning to question if it is even possible to distinguish Christian burials from non-Christians prior to the Middle Ages. Many of the criteria used are based characteristics of medieval Christian burials (Rebillard, 2009).

The criteria used by Watts (1991) are:

1. The occurrence of infant or neo-natal burials in cemeteries.

2. The presence of “Christian” iconography, inscriptions, and symbols present on artifacts from the cemetery (or external evidence for sites in the same region as the cemetery).

3. The organization of the cemetery including east-west alignment of graves, body position, and coffin type.

4. The absence of decapitated burials.

5. The presence of mausoleum or burial enclosures.

6. The absence of grave goods, and if present the type of grave good.

Each of these criteria is re-examined for the Butt Road cemetery and their potential relationship with Christianity.

Infant Burials

Watts considers the presence of infant burials within cemeteries a significant indicator of Christian conversion. However, Early Christian and Medieval church doctrine has a negative view of infants and church followers probably would not have been encouraged to bury unbaptized infants and neonates in the community cemetery. Augustine, writing in the 4th century AD states that unbaptized infants were condemned to hell for Original Sin (Murphy, 2011). While Augustine does not explicitly state that unbaptized infants should not be buried in the community cemetery, the Roman Catholic Church did eventually adopt this custom (Murphy, 2011).

There are no infant burials in Period 1 of Butt Road. Crummy et al. (1993) list 12 infant/neonate burials and an additional 20 graves of presumed infants (no skeletal remains were recovered from these graves) dating to Period 2 in their summary of burial characteristics. Under-representation of subadults due to taphonomic factors is frequently a problem in bioarchaeology but even if these 20 presumed infant graves are included, infants make up just 4% of Period 2 (32/682 in Period 2).

In comparison, the Bath Gate cemetery from Cirencester has 19 infants listed in the site report (5% of the total cemetery or 19/362). Moreover, infants make up 30% of the subadult skeletal sample from Cirencester while infants make up only 11% (12/108) of the total subadult skeletal sample from Butt Road. The infants and presumed infants are generally dispersed throughout the cemetery though there appears to be a loose cluster of infants in area B.

Demographers estimate that infant mortality rates in during the Roman period were 20%, or higher (Frier, 2010). While it is possible that Colchester had very low infant mortality rates, it seems more likely that infants were frequently buried in locations other than the formal cemetery, even in Period 2.

The Roman custom of not including infants within the community cemetery has been interpreted in a number of different ways. Infanticide is frequently mentioned and there are some burials that seem to support this practice. At Askkelon, in Israel, nearly 100 neonates were deposited in a Roman period sewer (Murphy, 2011). This burial is consistent with cross cultural disposal methods of unwanted infants, which include deposition in dung heaps, privies, public places, and waste areas (Murphy, 2011).

The frequency of infanticide in the Roman period has been debated and some authors suggest it was a common practice. For example, Mays and Faerman (2001) hypothesized that female infants may have been more likely to be victims than males and in order to test this hypothesis, Mays and Faerman (2001) conducted DNA analysis on a sample of 31 infant skeletal remains from the Roman cemeteries at Ancaster and Thistleton. This DNA analysis provided unexpected results; nine of the individuals were male and four were female. Mays and Faerman cautiously concluded that infanticide was not sex specific.

While infanticide is one reason for neonate death, it is certainly not the most common cause. Delivery complications, prematurity, low birth weight, infections, and asphyxia account for a majority of infant deaths in the world today (Requejo et al., 2010). In the Roman period, as with today, there was clear social distinction between a successful live birth, and a failed pregnancy that ends in miscarriage or stillbirth. Parents and other family members, such as older sibling, mourn failed births privately. Modern society, as well as in the past, has a difficult time dealing with the death of the very young (Murphy, 2011). The social mechanisms Romans used to deal with the deaths of infants of young children have influenced modern scholars' understanding of Romans' value of children.

The funeral rituals of infants and young children were much less elaborate than those of adults and written accounts suggest that Romans were discouraged from mourning these deaths in public (Dixon, 1992). Cicero's writings point to his own belief that mourning the very young was in bad taste, but this doesn't mean that all Romans felt the same way (Dixon, 1992).

Murphy (2011) explores parental reaction to the loss of stillborns and unbaptized infants and concludes that modern and historical research does not support some archaeological interpretations of parental indifference to infant death (deMause, 1974; Aries, 1973). However, Murphy notes that society as a whole often is poorly equipped to deal with infant death and miscarriage and so families often grieve out of the public eye.

The location of infant burials is often an important component to families' grieving process. In Ireland, unbaptized infants were buried in *cillini*. These unconsecrated cemeteries were often in visible and prominent locations where they were unlikely to be disturbed and could be easily visited (Murphy, 2011). The Roman practice of burying young infants near homes (presumably of their parents) may have been for similar reasons. The decision to bury infants within the formal community cemetery may have been related to the length of time the child lived after birth and the family's access to alternate burial locations.

Christian Iconography

Watts' next criterion concerns the presence of "Christian" iconography, inscriptions and symbols present on artifacts within the cemetery. The best evidence for Christian iconography concerns two lead coffins (Grave 295 and 403) that were excavated in the Butt Road cemetery.

These coffins are decorated on the lid and sides with “bead-and-reel St. Andrew’s Cross”, S and reversed-S motifs, circles, and pecten shells (Watts, 1991). Yet, these designs do not seem to be uniquely Christian (Barlow, 1993). Many of the symbols associated with modern Christianity, such as the simple cross or the crucifix depicting Jesus on the cross did come into use until the late 4th century AD or early Middle Ages (Petts, 2003). Likewise, the “chi-rho” eventually comes to represent Christ as “the anointed one” in the reign of Constantine in the 4th century (Petts, 2003). While a single piece of pottery recovered from the Butt Road cemetery had the Chi-Rho symbol etched in it, a single instance does not seem like enough to support the conclusions that a Christian community was present at Colchester (Crummy et al., 1993).

Cemetery Organization

Next Watts looks at the organization of the cemetery. She suggests that the reason burials favored an extended, supine position was due to Christian belief in resurrection. While it is true that Period 2 burials are all aligned east-west and all of the burials are extended burials, it should be noted that many cultures bury their dead in positions associated with sleep, either extended or fetal positions (Parker Pearson, 1999). Moreover, grave orientation can be influenced by many factors including topography of the site, proximity and relationships to buildings and roads, and local customs (Williams, 2006). It is also possible that extended burials may be more strongly associated with the physical limitations of a specific type of coffin construction. Finally, Barlow (1993) has argued that the idea that individuals had to be buried facing east for the resurrection is a Late Medieval concept and was likely not in place during the Late Roman period.

Watts also argues that the burials are largely undisturbed despite close proximity of graves, which would suggest some type of overall organizational scheme. However, during the analysis of the skeletal material and in looking at skeletal preservation, it seems that graves are more disturbed that she would like to acknowledge. Several Period 2 graves included in the skeletal sample were commingled (MNI=2). The density of graves appears to have negatively affected skeletal preservation. Some graves only contained skulls and thorax, while a few graves only contained lower limbs. This seems to suggest that earlier Period 2 graves were disturbed by later Period 2 graves. For example, Grave 101 disturbed Grave 93, and the lower legs of Grave 93 were rearranged to accommodate the new burial.

Decapitations

Watts also cites the absence of decapitated individuals as evidence for Christian burial. During the original excavation of the Butt Road cemetery, no decapitations were found. However, in 1997 thee burials were excavated at 47 Butt Road and one has cut marks on the vertebrae and skull (Benfield, 1997; Crummy, 2000). The skull was found at the individual's knees. The individual was found in a nailed timber coffin in a supine, extended position. Crummy (2000) speculates that the decapitation occurred post-mortem, perhaps even after the body was placed in the coffin.

A brief trauma analysis of these vertebrae conducted during data collection indicated the decapitation was the result of one perimortem wound from a sharp blade (a sword or possibly a small hatchet) (Figure 54). The cervical vertebrae have incision and cleft wounds affecting C1-C3. The direction of force appears to be from posterior to anterior and the body was likely face down when the blow occurred. Based on these wounds, it seems unlikely the body was already in a coffin at the time of decapitation.

Figure 54: Evidence for Decapitation[1]

[1]Butt Road 47 1998.14 C2 and C3 vertebra with sharp force trauma.
Photo: Lindsey Jenny

Moreover, this decapitated burial is one of the three graves found just south of the main Butt Road cemetery (Benfield 1997). Based on orientation, they appear to date to the 4th century AD. It is unclear if these graves are part of the main Period 2 cemetery. The graves are separated from the main portion of the cemetery by Roman pits. A tile tomb and a lead coffin were found in the area between these graves and the main cemetery in 1845 (Benfield, 1997). The presence of a decapitated burial in proximity to the Butt Road cemetery is another problematic factor for Watts' evaluation of Period 2 of the cemetery.

Associated Basilica Foundation

Watts also identifies the building associated with Period 2 of the cemetery as a church. The building is rectangular with an apse at the east end consistent with most basilicas. Christians began to use the basilica layout for churches beginning early in the 4th century AD (Millett, 1995). While the foundation is consistent with other early churches, there are other possibilities for the building's use. Basilicas were frequently used as meeting places for a wide variety of functions (Perkins, 1954). The building could also have been used to prepare bodies for burial or for funeral services. Millett (1995) does not accept the interpretation of the Butt Road building as a Christian church. Instead, he suggests that it was probably used as a funeral banquet facility.

Excavations in and around the building support the suggestion that feasts took place at the site. A smaller building (Building 140) was located west of the basilica foundation. The building contained a hearth and many pits, some of which contained charcoal and burned (animal?) bone fragments (Crummy and Crossan, 1993).

Pits in and around the basilica contained the bones of young pigs and domesticated fowl (Crummy and Crossan, 1993). The birds appear to have been brought to the site whole and then butchered. The birds are also larger than the fowl found in other parts of the town, suggesting that these birds were reserved for special occasions such as funeral feasts (Luff, 1993).

Millett (1995) also questions the assumption that the east-west orientation of the basilica influenced the orientation of the Period 2 graves. There are no firm dates for the construction of the basilica, though the coins found at the site suggest that the basilica was constructed no earlier than 294AD. Millett (1995) suggests that the grave orientation was influenced more strongly by the possible Roman road (with an east-west alignment) than the basilica's alignment.

Grave Goods

The low frequency of grave goods and grave good type also play a role in Watts' evaluation of the cemetery. Only 16% of the graves in the proportional stratified random sample of Period 2 used in the study have grave goods. However, Petts (1999) suggests that it is a misconception that Christianity prohibited the inclusion of grave goods. There seems to be temporal cycle in the amount and type of grave goods included in burials. The fourth century AD may mark a transition in this cycle to fewer graves goods associated with the deceased's dress or adornment. This trend of relatively few grave goods continues through the fifth and sixth centuries AD until grave goods increase during the Anglo-Saxon period (Petts, 1999). Petts suggests that attitudes towards the display or consumption of wealth are likely responsible for the reduction of grave goods rather than a change in religious belief.

A reanalysis of the cemetery suggests that many of Watts' criteria are too vague and open to interpretation to be reliable indicators of the presence of Christian burials. However, an anthropological mortuary analysis of the cemetery can still provide insight into agency, social status, and identity. The next section explores possible explanations for the burial rules and the agents responsible for developing and implementing these rules.

Other Explanations for Cemetery Distribution

Funeral rituals are part of a set of rules for disposal of the dead. An individual's location within the cemetery may be determined by family groupings, age, sex, and order in which they died. It is important to distinguish between typical burials and atypical burials within a single site and eventually a region (Morris, 1992).

Christian influences may be very difficult to identify in the 4th century mortuary practices observed in Roman Britain. Yet, cemeteries such as the Butt Road are highly organized and appear to have strict rules for burial. While religion may be a component of these rules, it cannot serve as the only explanation for the development of the burial patterns found in the 4th century AD. The following questions need to be addressed in order to understand the mortuary patterns present at the site.

Who is developing/enforcing the rules for burial?

Based on the discussion from Chapter Two, it appears unlikely that religion, in particular the Early Christian Church, took much interest in the actual physical burial of an individual prior to the Middle Ages. Philpott (1991) suggested that Imperial and/or town officials might have taken increased interest in cemetery organization as towns grew in size and cemetery space needed to be used more efficiently. In this case then, the rules for burial may be specific to the needs of each community and its designated cemetery space. There is some evidence that local elites were expected to maintain public resources in towns, so perhaps local elites were also responsible for designating cemetery space and managing burials within this space (Dark, 1994).

What are the rules for burial organization?

The Butt Road cemetery appears to have undergone a shift in the rules governing burial practices between Period 1 and Period 2. The rules for burial appear to be less strict in Period 1 than in Period 2 as can be seen in the variation in head orientation, the use of coffins, and grave good inclusions in Period 1. However, in Period 2, the rules for burial appear to be strictly enforced; head orientation only deviates in otherwise atypical pit burials, grave good inclusions are greatly reduced, and nailed timber coffins become the norm. The reduction in grave goods (especially pottery and glass, which were frequently place outside of the coffin) may reflect the need to conserve space. Perhaps only personal items used to adorn the body prior to burial were allowed during Period 2 as these would be contained within the coffin, allowing for smaller grave cuts and reducing the chance of disturbing existing graves.

Who are the agents responsible for burial?

While it is possible that some towns may have employed or at least designated grave-diggers as a means to maintain cemetery organization, burials were likely the responsibility of the family (Young 1975). The inclusion of personal adornment items and the manner in which the body was dressed is probably a reflection living relatives rather than the deceased's status. Petts (1998) suggests that women may have used the preparation of the body for burial as a means for expressing their own identity. Funerals and other religious rituals were areas where women could act openly within society and it is likely they took full advantage of these occasions (Hanson, 2010; Petts, 1998).

There is evidence the Romans were very concerned about ensuring they received proper burials even if they were living apart from the rest of their families. Romans developed funeral clubs that paid for funeral feasts and burial of members (Patterson, 1992). In the city of Rome itself, migration to the city and differences in social status would have made organizations like funeral clubs necessary. Membership within the club guaranteed that individuals would be buried and the pooled resources of the club allowed the ritual associated with the burial to be more elaborate than perhaps what a single individual could afford (Patterson, 1992)

While there is evidence of funeral clubs in cities in Italy, there is less information about them in the western part of the Empire. However, because of the purpose funeral clubs served, it seems likely that the idea of funeral clubs, like many other Roman traditions, would accompany tradesmen, soldiers, and imperial officials stationed in Gaul and Britain. Funeral clubs may have developed in Roman towns in Britain with strong links to the continent, such as Colchester.

Is the distribution within the cemetery based on a group characteristic?

The distribution of individuals within the Butt Road cemetery is not completely random. Graves are likely grouped by family or household. However, within those groupings, burials do not reflect modern preconceptions of cemetery organization. Young children (under 6 years of age) tend to buried near each other when possible and likely belong to the same family group or households. Husbands and wives were not necessarily buried right next to each other, as can be seen by the lack of consistent male/female paired graves. Instead, burial location within a family's area is probably a result of order of death

Summary of Mortuary Results

The chapter examines the spatial distribution of mortuary treatments, grave goods, demographic groups and skeletal stress indicators. In addition, the criteria suggested for the identification of Christian burials by Watts (1991) is reexamined based on the Butt Road cemetery sample and more recent excavations associated with the Butt Road site. The landscape surrounding the cemetery may play an important role in burial locations in both temporal periods. Crummy et al. (1993) note a possible Roman road running along the south edge of the cemetery. Head orientation in Period 1 appears to have a relationship to some feature (the road?) at the south edge of the cemetery. Most individuals are buried 'facing' the road in area A of the cemetery and head orientation begins to shift to the north the further from the road individuals are buried. It is unclear if there were other features on the landscape at the north edge of the cemetery that could also have served as a focal point in Period 1. The possible road may also have influenced burial location as a means of expressing status. In Period 1, graves oriented to towards the road generally also contained grave goods. Romans cemeteries were frequently located along roads and wealthy families often built elaborate tombs close to the road so that people on the road would be made aware of the their status (Toynbee, 1971). While there is no evidence for elaborate tombs or engraved headstones at the Butt Road cemetery, the choice of burial locations in the cemetery may still be a reflection of status.

Period 2 is marked by a shift in grave orientation to east-west with a majority of individuals with their head to the west. This shift in orientation does not have a clear association with changes in the landscape. The possible road is oriented generally east –west but did not influence grave orientation in Period 1 so it is unclear why the presence of the road would cause such a major change in Period 2. The presence of the road, or the date of its construction is not confirmed which is problematic for this analysis.

Alternatively, the shift in grave orientation may also represent a cosmological shift. Many religions, including Mithraism and Christianity use cardinal directions in rituals and to describe the landscape (Barlow, 1993). Burial location in Period 2 also appears to be influenced by the possible road. The cluster of graves with grave goods occurs in area A near the road. Grave goods become increasingly rare as the cemetery extends north.

Grave good type also varies between temporal periods. In Period 1, adult males and females are buried with a wide variety of grave goods but subadults are not buried with grave goods. Some grave goods, such as pottery are footwear primarily occur in Period 1 while in Period 2 personal adornment items were the primary type of grave good. There is also a shift in demographic groups buried with grave goods in Period 2. Subadults were buried with more grave goods than adult females and adult males were rarely buried with grave goods. This suggests a change in how status and identity of the deceased and their families is expressed during burial.

When the demographic distribution of the sample is examined there are several noticeable trends in Period 2. The cemetery is likely divided up into family or household groups. However, contrary to modern preconceptions of cemeteries, husbands and wives may or may not have been buried next to each other. Instead, family areas likely reflect order of death within the family rather than specific relationships between individuals. There is also a tendency to bury young children in groups.

The distribution of skeletal health indicators is fairly random suggesting that most family/household groups experienced the same general living conditions and had the same access to a nutritious diet. Cribra orbitalia occurs primarily in subadults in this sample. Unexpectedly, more subadults buried with grave goods have cribra orbitalia than subadults buried without grave goods. This result is contrary to the idea that grave goods are displaying higher social status. It might be assumed that higher status was accompanied by better access to food choices and care. This sample does not appear to support this idea so perhaps the grave goods associated with these subadults represents a different type of identity rather than a difference in socioeconomic status.

There does appear to be differences in the expression of identity within this sample. Several individuals appear to have been purposely excluded from the formal cemetery and two were buried with their heads to the east. The decapitated burial also occurred outside the formal bounds of the cemetery. This suggests that this was an area for people who had been excluded from the rest of the community for some reason. This may be an area reserved for criminals and other outcasts.

Finally, this chapter reevaluates the evidence for Christian religious practice in the Butt Road cemetery. One of the biggest problems with these criteria is the difference between religious belief and religious practice. Many other factors, including sex, age, family or group membership influence burial practices. As a result, these criteria do not reliably identify Christian burials. While it is certainly possible that Christians did live in Roman Colchester in the 4th century it cannot be confirmed that the cemetery only represents Christians.

The spatial analysis of mortuary treatments and skeletal health suggest that the Butt Road cemetery represents a town population with the same general socioeconomic status and local

Roman identity. However, it is not possible to assign religious belief to the individuals buried within this cemetery.

Chapter 6 Osteobiographies - Life and Death in Roman Colchester

Introduction

The results presented in Chapters Four and Five provide insight into health and mortuary practices at the group level but in doing so, take away from the individual experiences of people living in and around Roman Colchester. In order to develop a better understanding the individual experience at Roman Colchester, individuals from Period 1 and Period 2 are selected and their osteobiographies are presented in this chapter. Saul and Saul (1989) first used the term ‘osteobiography’ to describe the interpretation of human skeletal remains to illustrate the diversity in life experiences of individuals from cemetery samples (Robb, 2002). Following this idea, males, females, and subadults from Period 1 and Period 2 have been selected based on preservation and mortuary treatments to present the variety of life experiences of individuals from the Butt Road cemetery.

Most individuals buried in the Butt Road cemetery experienced relatively little skeletal stress in comparison with larger towns such as London (Chapter Seven). At Butt Road, there are few significant differences in skeletal between males and females suggesting the males and females were treated similarly as children and had equal access to dietary resources as adults. Adults from Roman Colchester were moderate in size and lived into middle age but few lived into old age (60 years +). Many appear to have suffered from respiratory infections resulting in maxillary sinusitis although poor dental health may also have contributed to these infections. Few individuals suffered from traumatic events such as fractures or long-term infections.

Overall, burial treatment is extremely consistent throughout much of the cemetery though several individuals stand out as unique based on skeletal stress indicators or mortuary treatments.

Within Period 1, the inclusion of grave goods appears to have a relationship to the age of the deceased and most likely their family's identity and social status within the community. Individual identity also appears to be expressed, especially by individuals who appear to be purposely excluded from the 'normal' area of the community. These individuals may have been some type of criminals or excluded based on religious beliefs or practices.

Period 1

Mortuary treatment has more variability within Period 1. Head orientation appears to be based on focal points outside the cemetery such as the possible Roman road at the south edge of the cemetery. Although skeletal preservation is generally poor, several individuals are complete enough to offer insight on life and death during Period 1 of the cemetery.

Grave 126

Grave 126 is an adult female skeleton from area A of Period 1. According to Crummy et al., (1993), Grave 126 was buried with her head to the north in a nailed timber coffin. Grave 126 was buried in a supine position with her left elbow bent so that her left hand was below her chin. A copper-alloy armlet was found near her left wrist. At the time of excavation, only her skull, upper limbs and lower limbs were recovered. It is unclear if Grave 126 had a grave marker but her grave was heavily disturbed by a later grave. Period 2 Grave 124 cut right through the middle Grave 126, apparently after Grave 126 was completely skeletonized. Grave 126's femora were re-deposited outside the coffin of Grave 124 in the southeast corner of the grave (Crummy et al., 1993:Fiche 412).

Grave 126 survived to adulthood suggesting that she was acknowledged by her parents at birth and provided for as a child. Textual evidence indicates that Romans practiced infanticide and the female infants were more likely to be victims than males (Scott, 1999). However, most

Roman cemeteries, including Butt Road, do not contain significantly more males than females suggesting that female infanticide was not practiced at high enough levels to affect the sex ratio of adults. Other textual evidence indicates that many families celebrated the birth of a daughter and mourned the death daughters in the same manner as sons (Scott, 1999).

In the case of Grave 126, she appears to have suffered from a period of physiological stress in early childhood. She has bilateral LEHs on her mandibular canines although her incisors and maxillary canines are unaffected. While the exact cause of these LEHs may never be known, they may have been the result of weaning stress, parasitic infection, or some other childhood illness (Ritzman et al., 2008). Despite the event or events that caused the LEHs, she survived childhood in apparently good condition. Her eye orbits are normal with no evidence of healed cribra orbitalia suggesting that she was provided adequate nutrition during childhood and adolescence. Although her femora were not preserved, her right tibia could be measured and is approximately 337mm. Using Trotter's (1970) stature equation for white females, Grave 126 was approximately 156.97 cm or 5 feet 1 inches tall. This would have been slightly below average for a female at this time. Roberts and Cox (2003) estimate average height for a Roman woman in Britain at 159cm or 5 feet 2 inches (Roberts and Cox, 2003).

Although her maxilla and mandible were in poor condition, she does not appear to have suffered from maxillary sinusitis or dental infections. Her teeth show moderate wear on the occlusal surface suggesting she probably reached early middle age before her death. Although her skeleton is fragmentary, there is no evidence of traumatic injuries or periosteal infections that may have contributed to her death.

Grave 126 survived well into adulthood so it is likely that she lived long enough to marry and gain other forms of social status available to Roman women. She was buried at the southern portion of the cemetery, which may have been a preferential location if there had been a road just beyond the southern edge of the cemetery. It is likely her family was responsible for her burial and chose to bury her with the copper armlet, which may have been a marker of her social status or may have been of sentimental value to her or her family members.

While the mortuary treatment and burial location of Grave 126 may indicate she or her family, were of high status, several males in Period 1 also show differences in mortuary treatment and possibly social status.

Grave 601

Grave 601 is a middle aged adult male. He was buried in area C of the cemetery with his head to the south. He was buried in a nailed timber coffin with hobnailed shoes and two pottery vessels also inside the coffin. A narrow necked painted Oxford ware jar was placed near his head in the south-east corner of the coffin. A Colchester colour-coated ware beaker was placed near his right knee. Outside of the coffin, in the southwest corner of his grave, a third pottery vessel was placed in an inverted position (Crummy et al., 1993: Fiche 852). Like Grave 126, Grave 601 was later disturbed by Period 2 graves.

Grave 601 appears to have survived childhood with little skeletal stress. His anterior teeth are not affected by LEHs suggesting he received adequate nutrition and care in infancy and early childhood. His left eye orbit is present and does not have evidence of cribra orbitalia. Unfortunately, none of his lower limb long bones are intact so it is not possible to estimate his stature. However, his femoral head diameter is approximately 49.58mm placing him well into the male range and suggesting he was fairly robust in build (Stewart, 1979).

After reaching maturity, Grave 601 began to develop some degenerative conditions. His left sinus contained reactive bone likely from an upper respiratory infection and his vertebral column began to develop osteoarthritis at the zygopophyseal joints. Grave 601 also suffered from severe dental caries. At the time of his death, his right maxillary premolar crowns had been destroyed by caries but the roots were still present. Prior to death, he had lost all of his maxillary molars and the alveolar processes showed significant signs of healing and remodeling suggesting the antemortem tooth loss had taken place at least several years before death. Grave 601's mandibular teeth were also affected by antemortem tooth loss and caries. His remaining teeth show moderate dental wear on the occlusal surface.

Grave 601 may have been a high status individual from Roman Colchester. The lack of physiological stress indicators from childhood suggests he may have received better care as a child than individuals such as Grave 126. However, as an adult he appears to have suffered from respiratory and dental infections. His dental caries and antemortem tooth loss are likely related to his diet. Carbohydrates and sugar are known to contribute to poor dental health over time. Carbohydrate rich foods such as wheat and barley were stables of the Roman diet. Honey and other sweeteners as well as sugar-containing imported fruits like figs and dates were also popular (Roberts and Cox, 2003). If the grave good items included in Grave 601's burial are representative of his social status in life, he may have had regular access to these types of foods with negative consequences to his oral health.

Clinical research has linked poor oral health to cardiovascular disease and other conditions (Joshipura et al., 1996). Poor oral health can affect systemic health negatively either directly or indirectly. Bacteria from oral infections can enter the blood stream and travel to the heart or other organs causing infections. Oral bacteria can also cause systemic inflammation and immune disorders (Joshipura et al., 1996). Poor dental health can also cause changes in diet, which can also contribute to poor cardiovascular health (Joshipura et al., 1996). It is possible that Grave 601's poor oral health contributed to his death through one of these routes.

After Grave 601's death, he was buried in the north-west part of the cemetery. Grave 601 was buried with his head at the south end of his grave. This may suggest some type of focal point along the northern edge of the cemetery. It is unclear if the pottery vessels buried with him contained food or liquids at the time of burial but the presence of these vessels and hobnail shoes suggest that the agents responsible for his burial, most likely his family members or other members of his household, wanted him to be prepared for the afterlife (Toynbee, 1971).

Grave 447

In contrast to the apparent high status of Grave 601, Grave 447 is a middle aged to old adult buried in area B of the cemetery with evidence of skeletal stress throughout life. The sex of this skeleton is somewhat ambiguous and there is no pelvis available. The glenoid fossa measures 41.09mm with is consistent with a male according to Bass (1995). Although the cranium is ambiguous, metric analysis suggests this individual could be male so it will be referred to as "he" in this osteobiography.

Grave 447 was buried with his head to the north end of his grave and does not seem to have been buried in a coffin. However, the dark stain around the skeleton suggests he was wrapped in some type of textiles, likely a shroud (Crummy et al., 1993: Fiche 705).

Grave 447 survived childhood but appears to have experienced a more stressful life than Grave 601. He has bilateral LEHs on his maxillary lateral incisors and evidence of healed cribra orbitalia in his right eye orbit. These markers suggest that he experienced a period of stress early in childhood and inadequate nutrition likely later in childhood or as an adult. His right tibia measures 344mm. Using Trotter (1970) tibia equation for white males, he would have been around 165cm tall or 5 feet 5 inches. This is below 169cm, the average stature estimate for males in Roman Britain by Roberts and Cox (2003).

Grave 447 suffered from poor dental health including periodontal disease, an abscess in the left maxilla and a great deal of antemortem tooth loss of his posterior maxillary and mandibular teeth. His remaining teeth have moderate to severe dental wear with little enamel remaining on the teeth. While the alveoli for his maxillary molars have healed, it seems likely that the infection from these teeth spread into the maxillary sinus. His right and left maxillary sinuses have noticeable reactive pitting in the floor of the sinus and on the walls (Figure 55).

Figure 55: Grave 447 Maxillary Sinus with Reactive Pitting

Grave 447 appears to have suffered from an injury to his left ankle. He has a healed callus on his left distal fibula and some rugged bone build up on the distal left tibia. This is not periosteal reaction but instead looks like the muscles and ligaments attaching to the distal tibia were affected by this injury resulting in pronounced entheses. This injury may have left him with a permanent disabilities and he may have used a cane compensate for this injury. His right elbow has evidence of eburnation on both the humerus and ulna. Unfortunately, the left upper limb was not recovered so it is unknown if this degenerative change was bilateral. However, according to the Mayo Clinic, many individuals with leg injuries use canes on the opposite side of the injury to compensate for the damaged limb (Mayo Clinic Staff, 2011).

In addition to the degenerative changes seen in his limbs, Grave 447 had extensive osteoarthritis and osteophytic lipping in his spine. Several vertebrae had fused together by the time of death, including C3/C4 and T10, 11, and 12 (Figure 56). This fusion appears to be more related to degenerative processes than a disorder such as DISH. The vertebral bodies of C5-T1 show evidence of osteoporosis resulting in kyphosis of the thoracic spine.

Figure 56: Grave 447 Fused Thoracic Vertebrae

While Grave 447 appears to have survived multiple stressful events during his lifetime, they probably had a negative effect on his health over time. When Grave 447 died, he was buried in a relatively isolated grave on the east side of area B. There are only two other Period 1 graves in the same row as Grave 447. After Grave 447 was buried, his grave was cut by a ditch dug later in Period 1, which destroyed the center of his grave. The lack of grave goods and coffin associated with Grave 447's burial and the multiple stress indicators and degenerative changes within his skeleton suggest that Grave 447 led a physically demanding life and probably came from a lower socioeconomic background than Grave 601. Grave 447 may have been a slave or a client associated with a wealthier household. It is possible he may also have been a retired military veteran who settled within the colony later in life.

While Grave 447, Grave 126, and Grave 601 lived will into adulthood and probably outlived many of their peers, not all individuals from Colchester were as lucky.

Grave 485

Grave 485 is a 3-4 year old child buried in area D of the cemetery. Grave 485 was buried in a nailed timber coffin with its head to the south of the grave. No grave goods were buried with this individual. Grave 485 was somewhat isolated from other Period 1 graves in the northwest corner of the cemetery.

Grave 485 survived infancy but died early in childhood. No anterior permanent crowns could be observed so it is unknown if this individual had LEHs. The eye orbits and cranial vault were also not recovered so it not possible to observe cribra orbitalia. However, the long bones of this individual are normal with no evidence of periosteal infection. The left maxillary sinus is also observable and normal suggesting that this child did not live long enough to develop signs of respiratory infection. The diaphyseal lengths of Grave 485's right humerus (112.26mm) and radius (74.44) suggest that this individual was much smaller than the children from the Maresh (1970) sample. In the Maresh (1970) sample, the average length of humeral diaphyses at three years of age was 147.5 mm for males and 145.3mm for females (Schaefer et al., 2009). The mean radial diaphyseal length for three year old males was 111.6mm and for females 107.7mm (Schaefer et al., 2009). Grave 485's humeral and radial diaphyses are almost 3 cm shorter than modern individuals of similar ages. It is possible that the dental age for this individual overestimates their chronological age but all of this individual's deciduous teeth had erupted and the first permanent molar crown was completely formed. All of the deciduous teeth were in occlusion, suggesting an age between 2-3 years (Ubelaker, 1979). However, it seems likely that this individual was suffering from stunted growth. Based on diaphyseal length alone, Grave 485 would have been similar in size to a 1.5 year old from the Maresh sample (Schaefer et al., 2009).

While five subadults from Period 1 were buried with grave goods, most of these individuals were older children or adolescents. No children in Grave 485's age group (2-5 years) were buried with grave goods suggesting that age played a major role in the decision to include grave goods for children in Period 1. This grave is located somewhat on the periphery of Period 1 graves, which may be a reflection of the status of this child's family within the community.

Like graves 447, 126 and 601, Grave 485 was disturbed by later Period 2 graves. Perhaps, because these burials were quite 'normal' for this community, they were eventually forgotten which may have led to their later disturbances by Period 2 graves. Robb suggests a " 'normal' burial in the village and subsequent forgetting would merge the deceased with the generic history and identity of the group." (Robb, 2002:165). While elaborate stone grave markers have been recovered from other cemeteries around Roman Colchester, no carved markers were recovered from the Butt Road cemetery (Crummy, 2001; Crummy et al., 1993). Some graves had evidence of tiles, posts, or building rubble used to mark their location but this was relatively rare (Crummy et al., 1993). As a result, many graves from both Period 1 and

Period 2 were disturbed by later burials. However, when burials were disturbed, such as Grave 126, disturbed remains were reburied as secondary deposits in the new graves. This suggests that when the agents responsible for digging Period 2 graves encountered previous burials, they attempted to treat these burials with respect.

Period 2

In contrast to Period 1 graves, which seem to rely on focal points in the landscape, such as roads, Period 2 graves all share the same east-west alignment and the majority of individuals were placed with their heads facing the west. This seems to indicate a shift in their cosmological view of the world (Barlow, 1993; Parker Pearson, 1999). As discussed in Chapter Four, the Period 2 sample did not experience a significant different amount of skeletal stress from Period 1. However, given the size of Period 2, there is more variation within the sample than within Period 1. The osteobiographies of individuals from Period 2 show a larger mixture life experiences but less variation in mortuary treatment. However, as seen in Chapter Five, differences in mortuary treatment did not necessarily reflect differences in skeletal stress levels.

Grave 174

Grave 174 contained an adult female buried in area A of the cemetery. She was buried in a nailed timber coffin with her head to west. Grave 174 is unique because she is the only adult female buried with personal adornment items. Grave 174 was buried with a silver hairpin, an antler comb, a ring on her right hand, a copper and glass bead necklace, copper and shale armlets, and a glass bottle inside the coffin at her feet (Crummy et al., 1993). The hairpin was found under her skull, suggesting that her hair had been styled prior to burial (Crummy et al., 1993).

Grave174 appears to have received special treatment in comparison to other female burials in the cemetery based on the inclusion of some many personal adornment items. However, her skeleton suggests that she experienced some type of physiological disturbance early in childhood. She has bilateral LEHs or her maxillary canines and mandibular central incisors (Figure 57).

Figure 57: Grave 174 Linear Enamel Hypoplasia on Maxillary Canine

It is not possible to observe cribra orbitalia in Grave 174 because her eye orbits are not preserved. While Grave 174 lived to adulthood she probably died as a young adult because her teeth have minimal wear for this sample. Unfortunately, her long bones were included in the sample for DNA testing, so it is not possible to estimate her adult stature.

The row of graves that Grave174 was buried within form a cluster of graves that included grave goods. Grave 171, Grave 180, and Grave 132 are part of the same burial row as Grave174.

These burials also included glass vessels or personal adornment items. Grave 174 appears to have been part of a special group of individuals within the cemetery. The identity of Roman women was based off of their relationships with male family members. The relatively elaborate burial of Grave 174 may have been a reflection of her father or husband's status rather than her own role in the community.

Grave 51

In contrast to Grave 174, Grave 51 appears to have been purposely excluded from the rest of the cemetery. Grave 51 is a middle aged adult female buried outside the possible cemetery boundary in area A. She was buried in a sloped side grave with no coffin and her head was placed at the east end of the grave. She is one of only two individuals in Period 2 with their heads to the east (as mentioned in Chapter 5). While Grave 51 survived to adulthood, she appears to have experienced several episodes of skeletal stress as a child. She has multiple LEHs on her canines and incisors. Her eye orbits are normal suggesting that if she had cribra orbitalia as a child; she lived long enough for the bone to remodel back to a normal appearance. However, her tibiae appear to be bowed slightly. This bowing may be the result of an inadequate in childhood, such as vitamin D deficiency, which can result in rickets (Ortner, 2003).

In addition to LEHs, Grave 51 exhibits evidence of antemortem tooth loss of her right maxillary first molar, right mandibular first and second molars and her left mandibular first molar. The loss of these teeth was likely related to diet and the development of dental caries. The alveoli for these teeth are completely remodeled, suggesting she lost these teeth several years before her death. Her skeleton shows no evidence of trauma or severe deformities so there does not appear to by a physical explanation for why she was excluded from the normal area of the cemetery.

Grave 622

Several individuals with evidence with of healed trauma were found within the main part of the cemetery. Grave 622 is a middle aged male from area D of the cemetery. Grave 622 was buried in a nailed timber coffin with no grave goods. Grave 622 was buried in the same grave cut a Grave 623, which suggest these individuals died very close together. According to Crummy et al. (1993), Grave 623 was a middle aged female but this skeleton was not selected for the sample used in this study. Grave 623 may be the wife or some other relative of Grave 622.

Grave 622 appears to have experienced little stress in childhood. He has no evidence of LEHs or cribra orbitalia. Grave 622 has a femoral length of 411mm; placing him around 159.2 cm or 5 feet 3 inches tall using the Trotter (1970) formulae for white males. As an adult, Grave 622 suffered some sort of accident that resulted in a fractured right tibia. Although the fracture healed, the callus is very large and the bone appears to have healed without being properly aligned resulting in noticeable shortening of the right tibia. There is also evidence of periosteal reaction or infection on the right tibia and right distal fibula (Figure 58). In addition, this individual has evidence of bony reaction from a respiratory infection in his frontal sinus. Grave 622 had decent dental health for this population with no antemortem tooth loss and only moderate dental wear.

Figure 58: Grave 622 Healed Fracture in Right Tibia

Only three males in Period 2 were buried with grave goods, so Grave 622's lack of grave goods suggests that he represents the 'norm' rather than the exception. The fact that his tibia eventually healed, although imperfectly, suggests some effort was made to immobilize the fracture and that he was cared for by his family or other members of the community while his leg healed. Tibia fractures were quite rare in this sample and are not associated with other traumatic injuries. This suggests that Grave 622's injury was likely the result of an accident rather than some sort of violent conflict.

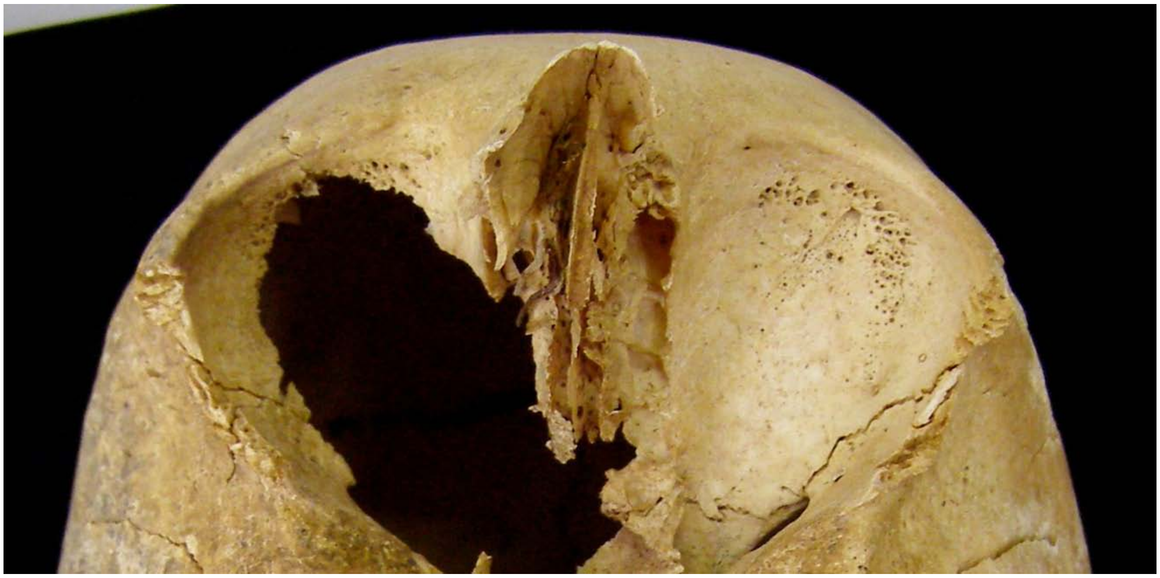
Grave 378

Grave 378 is a 10-12 year old child buried in area B of the cemetery. Grave 378 was buried in a nailed timber coffin with its head oriented to the west. Three bone and copper armlets were found in the north-east corner of the child's coffin below the child's feet. Grave 378 has no visible LEHs suggesting that he or she did not experience any intense periods of physiological stress during early childhood. However, the left eye orbit displays evidence of healed cribra orbitalia. This suggests that this child experienced a period of inadequate nutrition, probably several years prior to death but their diet seems to have improved again as the cribra orbitalia shows evidence of healing. The second permanent molars are beginning to erupt but based on the lack of epiphyseal fusion of the greater trochanter of the femur and the sacral segments, this child is probably closer in age to 10 years rather than 12 years. It is possible that this child also suffered from stunted growth. This child's femoral diaphysis is 291mm in long. When compared to the Maresh (1970) sample of modern children, it appears to be about the same size as a 7-8 year child (Schaefer et al., 2009). While other comparative studies have shown that ancient children did not grow at the same rates as modern children, this child may still be smaller than children with a similar dental age within the cemetery.

Grave 113

Grave 113 is a 12-year-old child from area B of the cemetery. Grave 113 was buried in a nailed timber coffin but was not buried with grave goods. Grave 113 also did not experience high levels of stress early childhood and has no visible LEHs. However, as Grave 113 aged, he or she also experienced a period of inadequate diet. Grave 113 has cribra orbitalia in both orbits although the right orbit is damaged. The left orbit displays foramina that are linked into the trabecular structure of the bone and it may have been active or just beginning to heal at the time of death (Figure 59). Grave 113 has a femoral diaphyseal length of 347mm placing it closer in size to modern children around the age of 10 years. However Grave 113's second permanent molars are completely erupted and no deciduous teeth are present. Grave 113 also has very small dental caries on its second molar's suggesting that these teeth have been exposed to bacteria in the mouth for some time.

Figure 59: Grave 113 Cribra orbitalia



As mentioned in Chapter Five, some subadults were buried with personal adornment items but overall most burials in Period 2 did not include grave goods. Grave 113 and Grave 378 represent 'typical' burials of children from the Butt Road cemetery. They seem to have received adequate care in infancy and early childhood but both individuals experienced periods of stress in childhood and appear to be smaller than modern children of similar ages (Maresh, 1970; Schaefer et al., 2009).

Summary

The osteobiographies presented in this chapter provide insight into the different life experiences of individuals from the Butt Road cemeteries depending on age, sex, and social status. The results of Chapter Four indicate that overall, the individuals from the Butt Road cemetery experienced low levels of stress and that there were few differences between the sexes. Adults from Colchester appear to be shorter in stature than the average estimated stature for males and females in Roman Britain (Roberts and Cox, 2003). It is unclear if this difference in stature is related to population genetics or if it represents some type of stunting in the Colchester sample. The osteobiographies from this chapter provide insight into the variation of life experiences within Roman Colchester and the individuals buried in the Butt Road cemetery. Although several of these individuals did suffer from injuries and long-term degenerative conditions, overall most individuals lived relatively "healthy" lives. The next chapter (Chapter Seven) compares the Butt Road cemetery sample to three other Romano-British skeletal samples to evaluate skeletal health at a regional level.

Chapter 7 Results of Inter-Site Analysis

Introduction

This chapter discusses the results of the comparative analysis of skeletal samples from the Butt Road cemetery sample, Roman South and Roman West from London, and Bath Gate Cemetery from Cirencester. While the Butt Road sample is compared to each sample separately, trends across all the samples will be discussed at the end of the chapter and in the following chapter. This comparison focuses on differences in skeletal stress between samples. Complete mortuary archaeological data from these comparative sites is not available so it was not possible to compare mortuary differences between these cemeteries in this analysis.

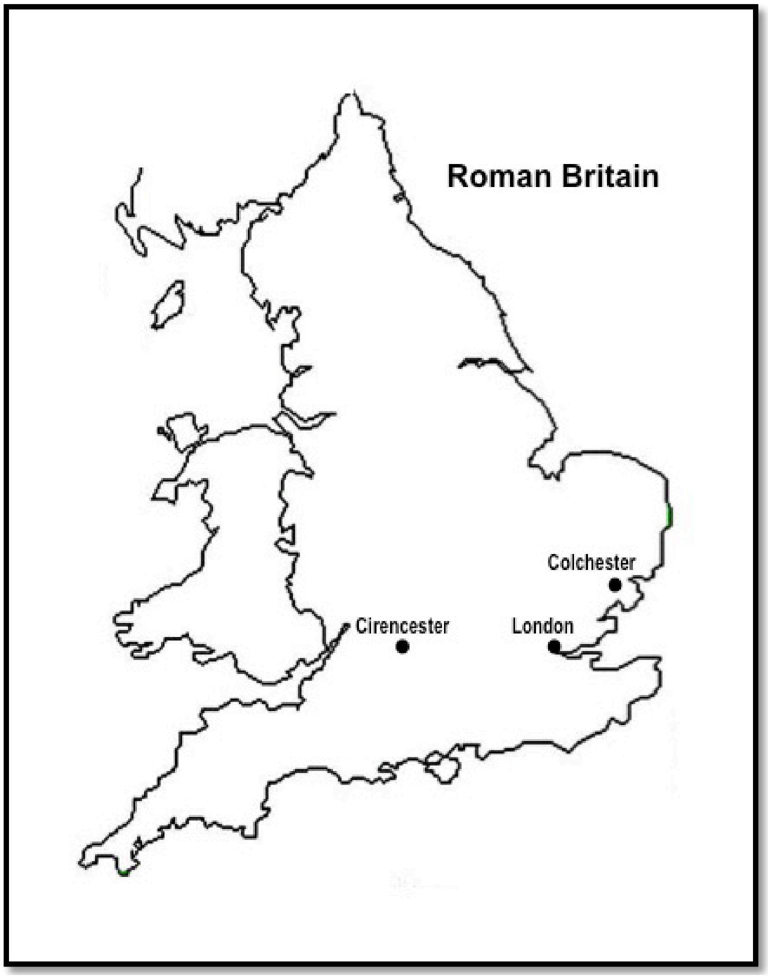
The cemeteries from which these skeletal samples are drawn from all date from the 1st century AD to the 4th century AD and are therefore roughly contemporaneous with each other. In addition, all are associated with Roman-established urban centers (Figure 60). However, each of these communities represents a different type of urban center within Roman Britain. Colchester was founded as a Roman colony, for veterans of the Roman army (Jones, 2004). London was founded based on its strategic location within the landscape and served as a political and economic entry point to Britain (Jones, 2004). Cirencester was founded as a *civitas* capital and acted as a local political administrative center and had a military base located at the southern edge of the settlement (Jones, 2004). The establishment of these communities under Roman rule and following roman principles of urban design helped to create local Roman identities within each community (Revell, 2009; Jones, 2004).

The skeletal samples drawn from these communities provide insight into social and biological differences both within and among these towns. The Butt Road cemetery appears to have been the main cemetery for Colchester during the 4th century, but was not heavily used in the 1st – 3rd centuries (Crummy et al., 1993). The Bath Gate cemetery also primarily contains 4th century AD burials although there are some earlier burials (McWhir, 1982). London Roman South and London Roman West appear to date primarily to the 1st and 2nd centuries AD although some burials were dated to the 4th century AD (Redfern and Mikulski, 2009).

While these sites can offer many insights into mortuary practices and physiological stress in Roman British towns, it is important to keep in mind that all cemetery samples are potentially biased subsets of larger populations. The criteria for burial within a specific cemetery may have been based on age, sex, or social status. It is common for communities to use multiple cemeteries at the same due to these different criteria. For example, in the case of Butt Road and Bath Gate, these are the only excavated cemeteries associated with their respective communities but archaeological surveys indicate that other Roman period cemeteries existed near these towns.

The extent to which cemeteries have been excavated may also affect comparisons. A large portion of the Butt Road cemetery was systematically excavated but the other cemeteries in this comparison have not been fully excavated due to urban development. The Bath Gate cemetery was excavated using a trench system rather than by individual graves so the full extent of the cemetery is unknown (McWhir, 1982). In the case of the London cemetery samples, several excavation sites are believed to be part of the same larger cemeteries. The Museum of London Archaeological Service (MOLAS) has grouped the skeletal remains from their excavations into two cemetery samples, London Roman South and London Roman West.

Figure 60: Roman Towns included in Inter-Site Analysis



Roman London

Roman London (Londinium**)** served as a political and economic entry point into the British province. It is unclear if an Iron Age settlement immediately preceded the Roman town, but it quickly became a strategic site for the Romans (Wacher, 1995). London served as an intersection for many of the main roads, as well as a port and crossing site for the Thames River (Wacher, 1995). In 60 AD, the initial settlement was destroyed in the Bodudiccan Rebellion. During the recovery process, London superseded Colchester as the provincial and economic capital of Roman Britain (Wacher, 1995). As a result, key elements of Roman urban architecture were built including a forum, basilica and offices for the provincial governor and other administrative officials (Wacher, 1995; Jones, 2004). While some of the expansion of London appears to have been unplanned, other areas, including the eastern hill, reflect Roman urban planning (Jones, 2004). Archaeological evidence suggests that Roman London underwent periods of rebuilding as public buildings and houses became more elaborate (Wacher, 1995). However the outskirts of the town and outlying villages still contained traditional round houses (Rowsome, 2000).

By the 2nd century AD, London had a large population. Steady migration to London resulted in an estimated population of around 20,000 people (Wacher, 1995, Rowsome, 2000). By comparison, Crummy (2001) estimates the population of Roman Colchester and its hinterland to be around 15,000 people. More to the point, many residents of Colchester had farms out in the hinterland while London residents appear to have made their living in shops, working at the docks, or in other urban industries (Rowesome, 2000). Therefore, many of these individuals would have purchased their food rather than growing it themselves.

Archaeological evidence indicates that cereals, including bread or porridge, and meat from cattle, sheep, or pigs and some poultry made up the majority of the diet. Fruit, including cherries, blackberries, apples, nuts, and herbs were also available (Rowsome, 2000). Because most food sources likely had to be purchased, limited access to dietary resources resulting in LEHs or cribra orbitalia may be more frequent in the London skeletal samples. Quality of drinking water may also affect population health. Roman London appears to have relied on wells, springs, and streams for water supply rather than an aqueduct. However, water pollution from run-off and industry may have been become a problem (Rowsome, 2000).

Roman South

The London Roman South cemetery has been partially excavated as part of urban development projects in London. The skeletal sample from this cemetery consists of 46 individuals recovered from 1973-1996 as part of small excavations of a few burials at a time. These burials are believed to be part of the same larger cemetery located on the South Bank of the Thames in the modern boroughs of Southwark and Lambeth (Redfern and Mikulski, 2009). Mortuary treatments range from cremations, to inhumations in wooden coffins with iron nails, to plaster packed burials. Grave orientation is not given for all burials but there is a mixture of north-south and east-west oriented graves (Redfern and Mikulski, 2009). Grave goods were recovered with some burials and include ceramics, glass, copper and iron jewelry, hobnails, and coins (Redfern and Mikulski, 2009).

Roman West

London Roman West cemetery sample consists of 137 individuals excavated from multiple sites from 1986-1997 (Redfern and Mikulski, 2009). It would have been located on the western edge of Londinium and is still today located at the western end of the modern City of London and (Redfern and Mikulski, 2009). The Department of Urban Archaeology and the Museum of London Archaeological Services (MOLAS) excavated several areas of the cemetery (Redfern and Mikulski, 2009). The cemetery contained some cremation burials but was primarily characterized by inhumations. According to the available site reports, grave orientation was either north-south or east-west, but unfortunately, these same reports do not specify which burials were in which orientation. Grave goods primarily consisted of personal adornment items, coins, pottery, and glass, though one female burial included a brass bell (Redfern and Mikulski, 2009

Roman Cirencester

Cirencester is the modern town located on the site of Roman *Corinium*. The Roman army moved into western England around 44 AD and established several military forts in the area. The Roman town was founded as a provincial capital around 60AD. Wacher (1995) suggests that the town grew in relation to a cavalry fort. The town was fortified, although dating the fortifications is complicated. The fortifications appear to have been constructed, reconstructed, and repaired over the course of 200 years (Wacher, 1995).

Cirencester became an important market and entertainment center. The town follows the typical Roman pattern and includes a forum and separate market area, many shops, possibly a sculptor's workshop, and an amphitheater located outside the Bath Gate on the west edge of the town (Wacher, 1995). The town also served as a religious center for the area. Roman and Celtic deities are portrayed in sculpture and mentioned in inscriptions found in the town (Wacher, 1995). However, no temple sites have been located in the town. The town has also been linked to Christian conversion in the 4th century and Wacher (1995) suggests that one of the British bishops mentioned in the Council of Arles in 314AD is from Cirencester.

The Bath Gate Cemetery

The Bath Gate Cemetery is located on the edge of Cirencester along the Roman road to Bath. The Cirencester Excavation Committee excavated the cemetery primarily from 1969-1976 through a series of trenches rather than individual graves. The excavations were divided into two areas, to the north and south of Fosse Way. The present study is concerned only with the data for the 362 individuals from south of Fosse Way. Burial position, body orientation, grave goods, and coffin type were recorded in relation to each burial (McWhir, 1982). Grave goods, including

Roman coins, were used to date the burials. Most graves seem to date to the 3rd and 4th centuries AD although a few graves are dated to the 1st and 2nd centuries AD.

The Bath Gate Cemetery is somewhat unique among Roman British cemetery samples because it has a high concentration of males, many of which show evidence of trauma. This may be a result of the specific use of this cemetery for individuals associated with the military fort. This would mean that the rest of the town may have used other cemeteries that have been identified outside the town near the gates of the roads to Verulanmium and Silchester. In 1881, a number of tombstones were recovered during the Midland Railway construction but no formal excavation seems to have taken place (Wacher, 1995). However, the lack of excavation at the other cemeteries associated with the town makes it difficult to understand the criteria for burial within the Bath Gate cemetery in relation to the rest of the town's population.

Several individuals from the Bath Gate cemetery show evidence of decapitation and other sharp force trauma (personal observation during pilot study). The amount and type of trauma in the Bath Gate sample is very different from the other three cemetery samples. Although Wacher (1995) suggests that the cavalry fort was abandoned and absorbed by the town, the combination of fortifications and skeletal trauma from the Bath Gate Cemetery suggest a military presence remained in the area during the town's occupation.

In addition, the demographic profile of the skeletal material recovered from the site reflect and different population. Over half (57%) of the Bath Gate cemetery sample is male. Females make up about 25% of the Bath Gate sample, while subadults make up 17% of the sample. However, the age distribution of the Bath Gate subadults is also very different from the other three sites. Infants make up 30% of the subadult sample at the site. The comparatively large number of infants found in the Bath Gate cemetery is another unusual characteristic of this cemetery. As discussed in Chapter Five, infants are generally under-represented in formal cemeteries in Roman Britain. The decision to bury infants within the formal cemetery at Bath Gate may imply a different view of infants themselves and perhaps a different process for mourning the loss of infants and neonates.

Working with Comparative Data Sets

One difficulty of this comparative analysis concerns the fact that it relies on data sets collected by other observers. As a result, not all of the skeletal stress indicators used in this study were available for all of the samples. For some stress indicators the total number of skeletal elements recorded in the inventory had to be substituted for the number of skeletal elements observable for a health indicator. For example, the presence of maxillary sinusitis was noted in the London samples but the number of individuals with observable but unaffected maxillary sinuses was not recorded for either London Roman West or London Roman South. To compensate for this missing data, the frequency rates for maxillary sinusitis in the London samples are calculated using the number of individuals with maxillary sinusitis divided by the number of individuals with at least one maxilla present in the skeletal inventory. Cribra orbitalia, LEHs, and periostitis have been similarly assessed and are included in the comparison for London Roman South and London Roman West. Periostitis is only included if it occurred on the long bones.

The Bath Gate skeletal data is even more challenging because it was collected prior to physical anthropologists' attempts to standardize data collection, such as Standards (Buikstra and Ubelaker, 1994) or The Global History of Health Project's Data Collection Codebook (2006). This lack of data standardization results in missing or incomplete data needed for some comparisons. The skeletal inventories for the Bath Gate sample often do not list specific bones or include the condition of the cortical surface of long bones. Pathologies such as maxillary sinusitis or periostitis are recorded but the number of individuals observable for these pathologies is not. For this reason, maxillary sinusitis and periostitis are excluded for the Bath Gate cemetery comparison.

On the other hand, the number of observable individuals or elements is available for cribra orbitalia and LEHs. It should be noted that this study relies on the dental inventories available in the microfiche included in the site report, which does not contain the same number of individuals that are reported in the McWhir (1982) volume and the microfiche. There are 44 individuals with LEHs present all teeth, including premolars and molars reported in the human bone report in McWhir, (1982). However, the number of observable teeth was not reported in the volume. The microfiche notes included individual dental inventories. A review of these inventories results in 45 individuals with LEHs on only anterior teeth out of 190 individuals with anterior teeth. For the comparison between Butt Road and Bath Gate, the microfiche data will be used for LEHs. The Butt Road and London samples only include LEHs on anterior teeth so the microfiche data appears to be more compatible with the other samples. It is also possible to compare some subadult diaphyseal lengths between the samples and over all adult growth. Long bone measurements were also recorded for adult males and females from the Bath Gate cemetery.

This comparative analysis is meant to provide insight into regional variation in biocultural stress throughout the period of the Roman occupation of Britain. Therefore Period 1 and Period 2 samples from Butt Road are combined into one sample for the comparative analysis. The tables in this chapter for Butt Road include all of the health indicators used for the comparative analysis.

Pearson's chi-square is used to test for significance at the p = 0.05 levels. In cases where expected cell size was less than five, Fisher's exact test is used to examine significance between samples.

Demographic Overview of the Samples

As mentioned in Chapter Three, The Butt Road age categories are compatible with the London samples' age categories. However, the Bath Gate cemetery data included different age ranges that were not compatible with either the Butt Road or London samples. To compensate for this, the median age is calculated and used to place the individuals in the age categories used by the other samples. The tables below break down the number and frequency of each demographic group for the Butt Road cemetery and the three comparative samples.

Table 44: Inter-Site Subadult Age Demographics[1]

Cemetery	Butt Road	%	London Roman South cemetery	%	London Roman West cemetery	%	Bath Gate[1]	%
Infant	5	*8.7*	2	*11*	0	*0*	19	*30*
Early Child	18	*31.6*	6	*33*	8	*25*	15	*24*
Late Child	19	*33.3*	4	*22*	7	*21.9*	10	*16*
Adolescent	13	*22.5*	6	*33*	12	*37.5*	19	*30*
Subadult Only	2	*3.5*	0	*0*	5	*15.6*	0	*0*
Total	57	*100*	18	*100*	32	*100*	63	*100*

[1]Based on Table 33 (McWhirr et al.,1982:137).

Table 45: Inter-Site Adult Demographics by Age and Sex[1]

Cemetery	**Butt Road**	**%**	**London Roman South cemetery**	**%**	**London Roman West cemetery**	**%**	**Bath Gate[1]**	**%**
Young Males	5	*4*	4	*14*	2	*2*	24	*8.4*
Middle Males	27	*21.9*	5	*18*	11	*10*	94	*32.7*
Old Males	5	*4*	1	*3.5*	0	*0*	46	*16*
Adult Males	15	*12*	1	*3.5*	22	*21*	35	*12*
Young Females	8	*7.5*	2	*7*	2	*2*	15	*5*
Middle Females	18	*14.6*	7	*25*	10	*9*	39	*13.6*
Old Females	2	*1.6*	0	*0*	2	*2*	16	*6*
Adult Females	13	*10.5*	1	*3.5*	8	*7.6*	18	*6*
Unknown Young	1	*0.8*	0	*0*	1	*1*	0	*0*
Unknown Middle	0	*0*	0	*0*	2	*2*	0	*0*
Unknown Old	0	*0*	0	*0*	1	*1*	0	*0*
Unknown Adult	14	*11.3*	7	*25*	44	*42*	0	*0*
Ambiguous Adult	15	*12.4*	0	*0*	0	*0*	0	*0*
Total	123	*100.6*	28	*99.5*	105	*99.6*	287	*99.7*

[1]Based on Figure 82 and text on p135 (McWhir et al.,1982:135-136). Wells reports that there are 362 individuals from south of Fosse Way, 63 of which are subadults. 12 individuals are not accounted for either as subadults or as adults in the age break down.

The cemeteries from Butt Road and London include all ages and both sexes suggesting minimal burial selection criteria for these sites (Grauer, 1998). However, females and subadults are under-represented in the Bath Gate cemetery. Subadults represent 17% of the Bath Gate sample in comparison to 31.7% of the Butt Road sample, 39% of London Roman South cemetery, and 23% of London Roman West cemetery. At the same time though, Bath Gate has the highest frequency of infants (>1 year) of the comparative subadult samples. Infants make up 30% of the subadults represented at Bath Gate while they represent only 9% of subadults at Butt Road, 11% London Roman South, and no infants were recovered at London Roman West cemetery. It is interesting that so many infants appear in the Bath Gate cemetery given the lack of infants in most Roman period cemeteries. Older children are often better represented due to both taphonomic factors and cultural burial practices during the Roman period. For example, older children (6-11 years) are most frequent in the Butt Road sample followed by young children (2-5 years). Adolescents and young children are equally represented in London Roman South cemetery, and adolescents are the most frequent type of subadult in London Roman West cemetery. The difference in infant representation between the samples is interesting and will be discussed in greater detail in the Chapter Eight.

In addition, males are much more frequent in the Bath Gate cemetery compared to the other samples. Males make up 55% of the Bath Gate sample while they represent about 30% of the Butt Road sample, 24% of London Roman South, and London Roman West samples respectively. The demographic profile differences between Bath Gate and the other samples may indicate a difference in the populations using the cemeteries or a different criterion for burial within the cemetery.

Comparing Butt Road and London Roman South

The first comparison between Butt Road and London Roman South samples looks at the adult samples used for this study.

Adults

Tables 46 and 47 present the number and frequency of skeletal stress indicators for adults from Butt Road and London Roman South respectively. Figure 61 shows the frequency of each health indicator in both cemeteries. Fisher's exact test and chi-square statistics are calculated for cribra orbitalia ($p = 0.0009$) and LEHs ($\chi^2 = 9.32$ df=1). The presence of both cribra orbitalia and linear enamel hypoplasias is significant for the overall adult samples. The adults from London Roman South have significantly more cribra orbitalia and LEHs than Butt Road adults. However, there is no significant difference in the presence of periostitis and maxillary sinusitis between the samples. The frequency of periostitis is slightly higher in the London Roman South sample than Butt Road (χ^2=0.24 df=1). The frequency of maxillary sinusitis is much higher in the Butt Road sample (45%) compared to the London Roman South sample (14%) but Fisher's exact test is not significant (p = 0.22).

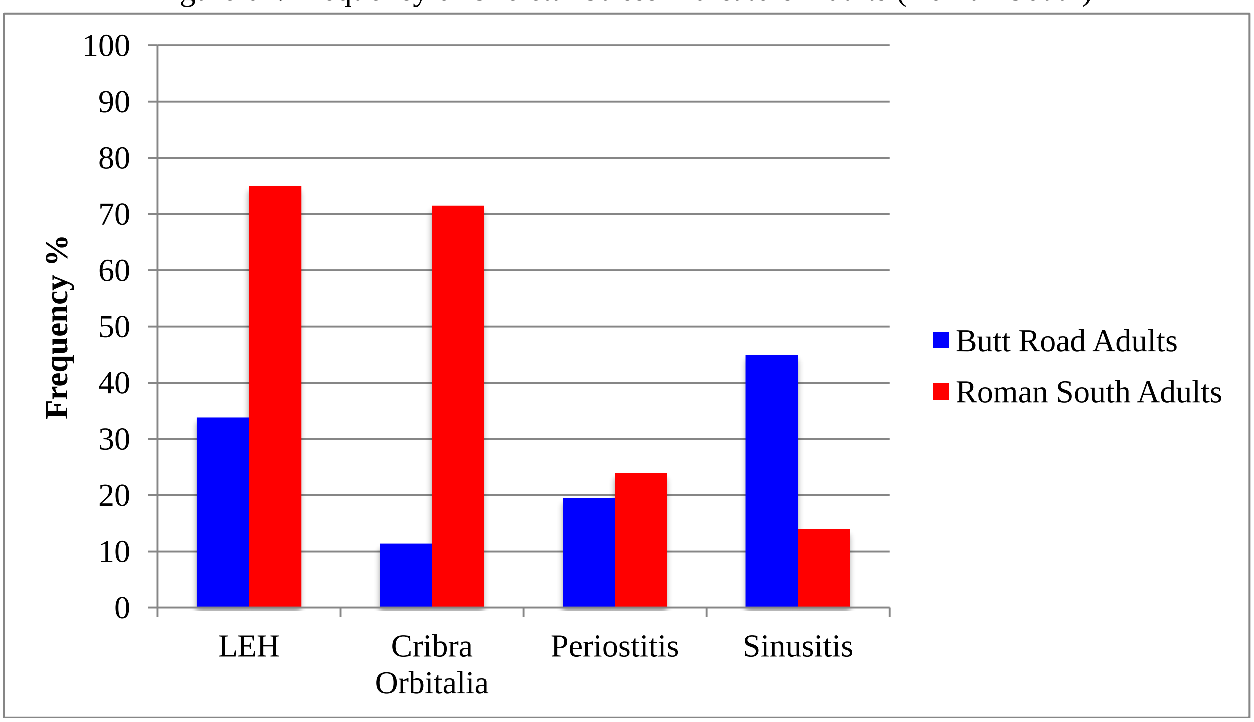
Table 46: Skeletal Stress Indicators in Butt Road Adults

Pathology	Present	Absent	Total	Frequency %
LEH	26	51	77	*33.8*
Cribra Orbitalia	9	70	79	*11.4*
Periostitis	15	62	77	*19.5*
Sinusitis	27	33	60	*45*

Table 47: Skeletal Stress Indicators in Roman South Adults

Pathology	Present	Absent	Total	Frequency %
LEH	12	4	16	*75*
Cribra Orbitalia	5	2	7	*71.5*
Periostitis	6	19	25	*24*
Sinusitis	1	6	7	*14*

Figure 61: Frequency of Skeletal Stress Indicators Adults (Roman South)



Adult Females

When adult females from Butt Road and London Roman South are compared, there are clear differences in skeletal stress levels between the samples. There is a significant difference in the presence of cribra orbitalia (p=0.04) and LEHs (p=0.0057) in females from the two samples. Females from London Roman South have much higher frequencies of cribra orbitalia (66%) and LEH (88%) than Butt Road females (8.5% with cribra orbitalia and 31% with LEHs). However, there is not a significant difference in the presence of periostitis in females from both samples (p=0.55). As previously mentioned, comparing sinusitis is problematic but no females from London Roman South were recorded with maxillary sinusitis though three individuals had maxilla present. While sample size is an issue, Fisher's exact test found no significant difference between the samples for maxillary sinusitis (p=0.23). Tables 48 and 49 and Figure 62 present the number and frequency of each indicator for adult females in each cemetery.

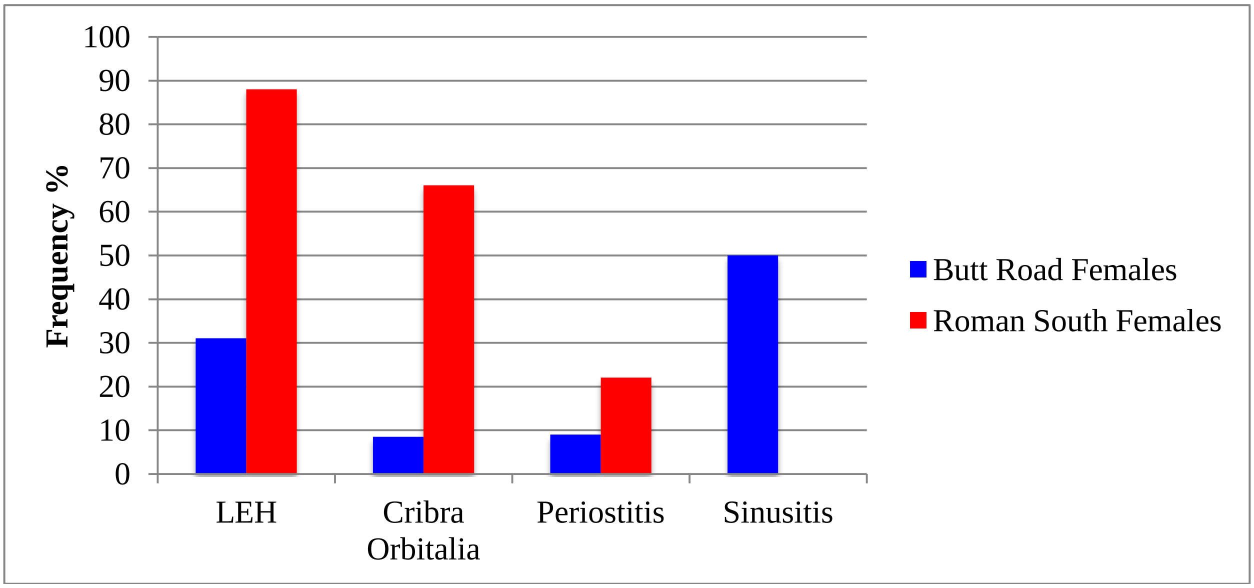
Table 48: Skeletal Stress Indicators in Butt Road Females

Pathology	**Present**	**Absent**	**Total**	**Frequency %**
LEH	11	24	35	*31*
Cribra Orbitalia	3	32	35	*8.5*
Periostitis	2	23	25	*9*
Sinusitis	12	12	24	*50*

Table 49: Skeletal Stress Indicators in Roman South Females

Pathology	**Present**	**Absent**	**Total**	**Frequency %**
LEH	7	1	8	*88*
Cribra Orbitalia	2	1	3	*66*
Periostitis	2	7	9	*22*
Sinusitis	0	3	3	*0*

Figure 62: Frequency of Skeletal Stress Indicators Adult Females (Roman South)



Adult Males

When adult males from Butt Road and London Roman South are compared, the only significant difference between the two samples is cribra orbitalia (p=0.04). Males from London Roman South have a much higher frequency of cribra orbitalia than males from Butt Road. There is no significant difference in the presence of periostitis (p=1), LEHs (p=0.23), or maxillary sinusitis (p=0.62). Tables 50 and 51 and Figure 63 shows the number and frequency of health indicators of adult males in each sample.

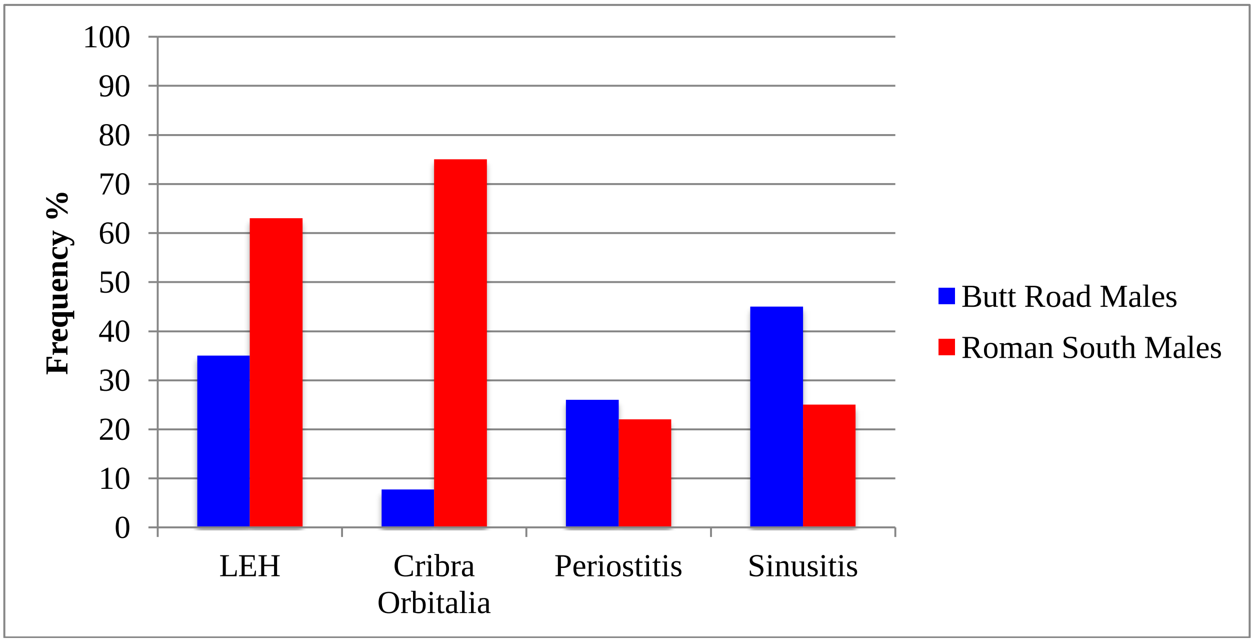
Table 50: Skeletal Stress Indicators in Butt Road Males

Pathology	Present	Absent	Total	Frequency %
LEH	14	26	40	*35*
Cribra Orbitalia	3	36	39	*7.7*
Periostitis	11	31	42	*26*
Sinusitis	14	17	31	*45*

Table 51: Skeletal Stress Indicators in Roman South Males

Pathology	Present	Absent	Total	Frequency %
LEH	5	3	8	*63*
Cribra Orbitalia	3	1	4	*75*
Periostitis	2	7	9	*22*
Sinusitis	1	3	4	*25*

Figure 63: Frequency of Skeletal Stress Indicators Adult Males (Roman South)



Comparing Long Bone Lengths

The maximum lengths of femora and tibiae are compared between the Butt Road sample and London Roman South. The comparison of maximum long bone lengths can indicate differences in population origin and provide insight into the ability to recover from skeletal stress experienced in childhood. The following tables summarize the long bone lengths for males and females from Butt Road and London Roman South with intact femora and tibiae.

Table 52: Butt Road Maximum Femur Length

Sex	Number	Minimum	Maximum	Mean	St. Dev.
Male	27	396	477	440.44	23.68
Female	12	280	433	402.75	44.24

Table 53: Butt Road Maximum Tibia Length

Sex	Number	Minimum	Maximum	Mean	St. Dev.
Male	25	301	415	359.96	28.67
Female	10	286	360	327.2	21.0

Table 54: Roman South Maximum Femur

Sex	Number	Minimum	Maximum	Mean	St.Dev.
Male	0	0	0	0	0
Female	4	400	452.0	434.375	23.8

Table 55: Roman South Maximum Tibia

Sex	Number	Minimum	Maximum	Mean	St.Dev.
Male	2	348.5	361.0	354.75	8.8
Female	3	318.0	375.5	347.2	28.8

Independent t-tests are used to compare the long bone lengths from Butt Road and Roman South. No significant differences are found between female maximum femur lengths. Male maximum femur lengths could not be compared. There are no significant differences in the maximum length of tibia between the Butt Road sample and Roman South for males and females.

Subadults

The comparison of the subadult samples from each cemetery are summarized in tables 56 and 57, which show the frequency of the Butt Road and London Roman South subadults respectively. Following the trend seen in the adult samples, London Roman South subadults have higher frequencies of all health indicators except maxillary sinusitis. There are significant differences in the presence of cribra orbitalia (p=0.0008) and LEHs (p=0.003). There are not significant differences between the samples for periostitis (p=0.4) and maxillary sinusitis (p=0.53). Figure 64 shows the frequency of the indicators of health for each subadult sample.

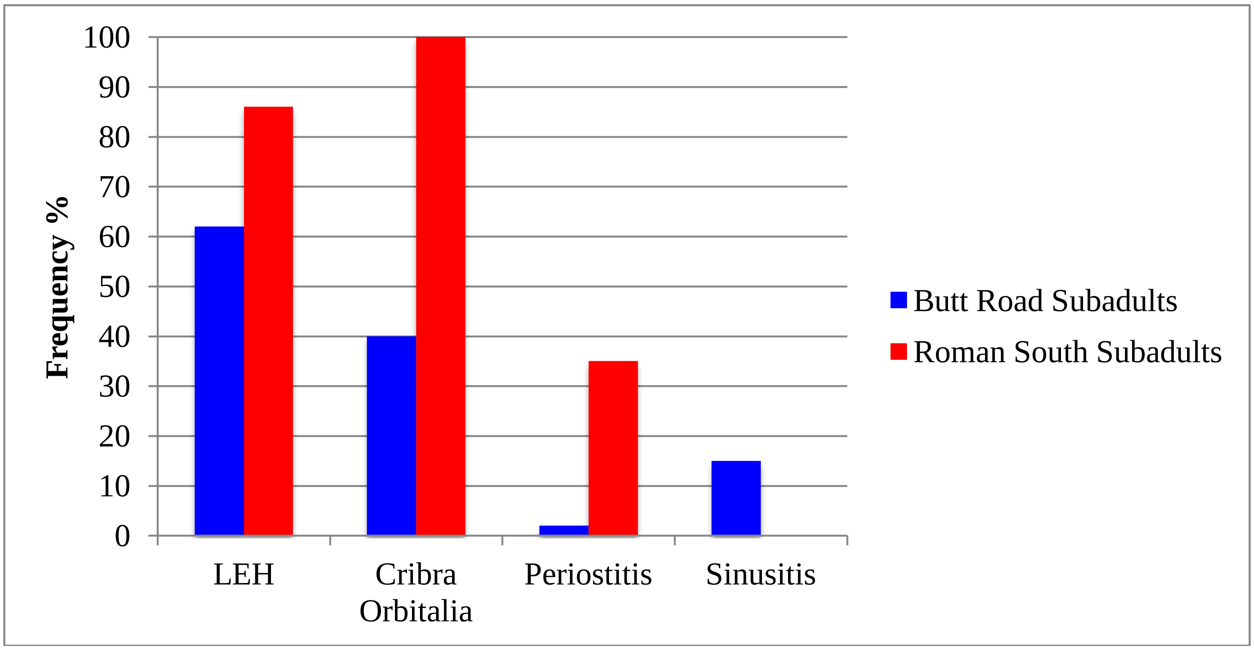
Table 56: Skeletal Stress Indicators in Butt Road Subadults

Pathology	Present	Absent	Total	Frequency %
LEH	16	10	26	*62*
Cribra Orbitalia	14	21	35	*40*
Periostitis	1	36	37	*2*
Sinusitis	3	17	30	*15*

Table 57: Skeletal Stress Indicators in Roman South Subadults

Pathology	Present	Absent	Total	Frequency %
LEH	6	1	7	*86*
Cribra Orbitalia	7	0	7	*100*
Periostitis	6	11	17	*35*
Sinusitis	0	8	8	*0*

Figure 64: Frequency of Skeletal Stress Indicators in Subadults (Roman South)



Comparing Butt Road and London Roman West

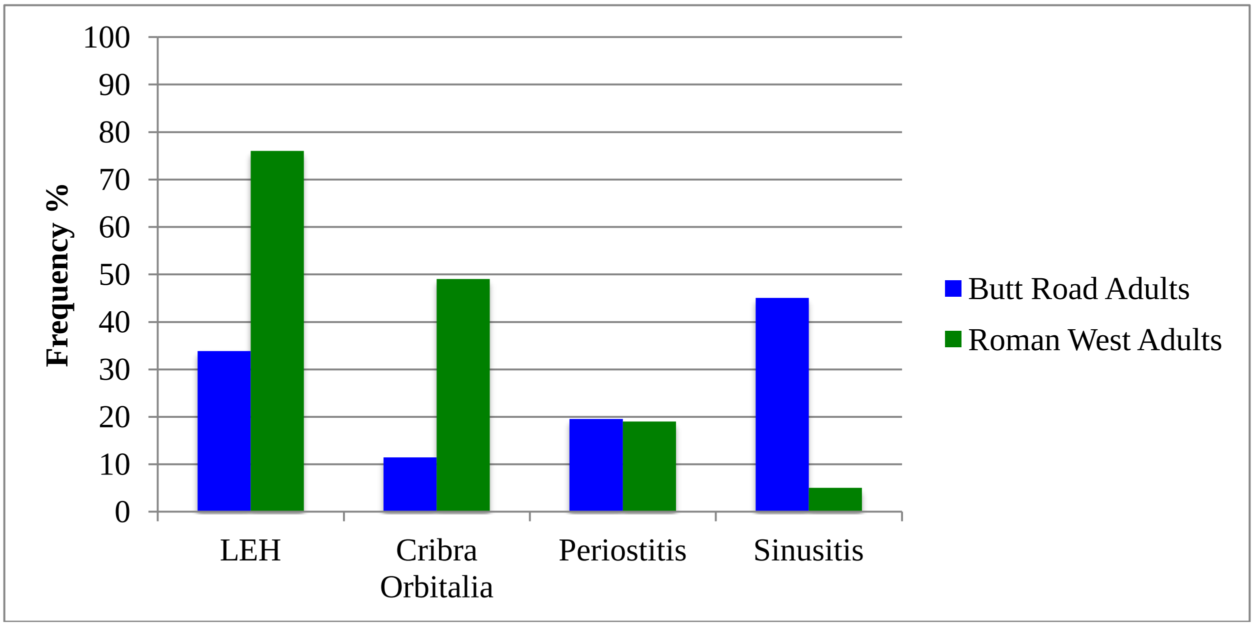
The frequency rates for London Roman West adults are summarized in Table 58. When compared to the evidence for Butt Road adults found in the previous section, the frequency rates for London Roman West are higher for cribra orbitalia and LEH, nearly equal for periostitis, and lower for maxillary sinusitis. Pearson's chi-square and Fisher's exact test are used to test for significance at the p=0.05 levels. There are significant differences in the presence of cribra orbitalia (χ^2=21.05 df=1), LEHs (χ^2=21.63 df=1), and maxillary sinusitis (χ^2=9.95 df=1). There is not a significant difference in the presence of periostitis (χ^2=0.02 df=1). Figure 65 shows the frequency of health indicators for adults from both samples. It should be noted the while London

Roman West adults have much higher frequencies of cribra orbitalia and LEHs; Butt Road adults have a higher frequency of maxillary sinusitis.

Table 58: Skeletal Stress Indicators in Roman West Adults

Pathology	Present	Absent	Total	Frequency %
LEH	38	12	50	*76*
Cribra Orbitalia	21	22	43	*49*
Periostitis	13	57	70	*19*
Sinusitis	2	37	40	*5*

Figure 65: Frequency of Skeletal Stress Indicators in Adults (Roman West)



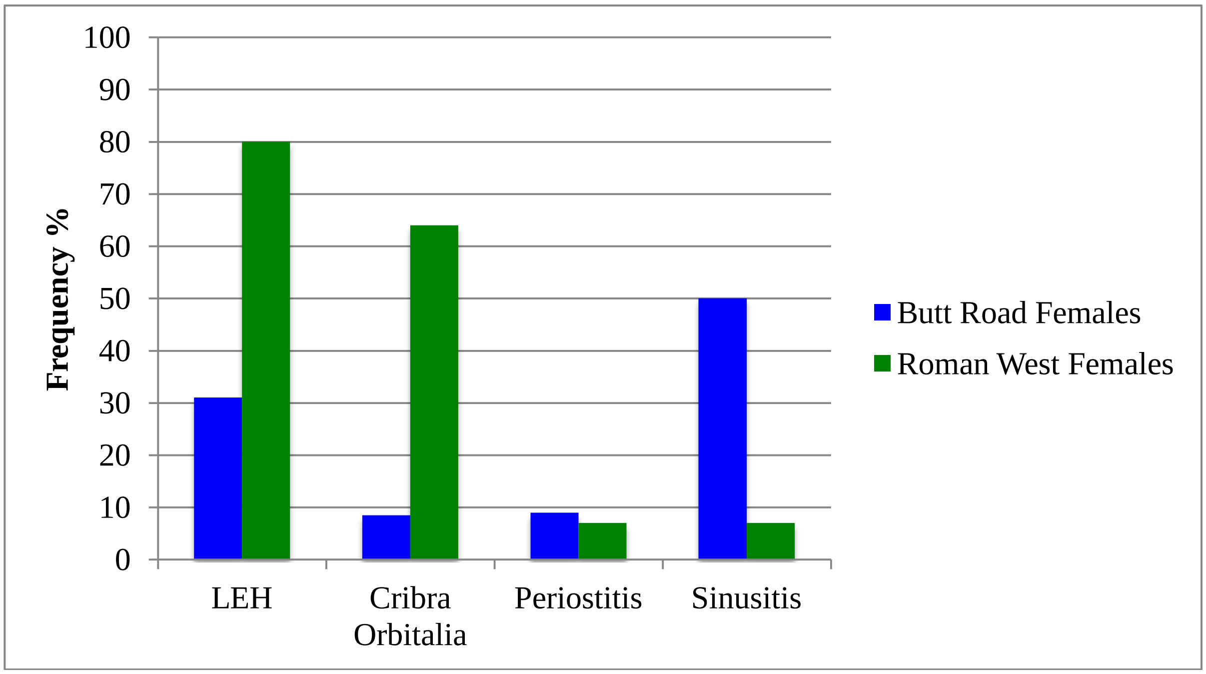
Adult Females

When adult females from Butt Road and London Roman West are compared there are significant differences in the presence of cribra orbitalia (p=0.0006), LEHs (χ^2=9.97 df=1), and maxillary sinusitis (p=.01), but there is no significant difference in the presence of periostitis (p=1). Adult females from London Roman West have a much higher amount of cribra orbitalia and LEHs compared to Butt Road females. However, Butt Road females have much more maxillary sinusitis. The frequency of health indicators for adult females from London Roman West is displayed in Table 59 and Figure 66.

Table 59: Skeletal Stress Indicators in Roman West Females

Pathology	Present	Absent	Total	Frequency %
LEH	12	3	15	*80*
Cribra Orbitalia	7	4	11	*64*
Periostitis	1	14	15	*7*
Sinusitis	1	13	14	*7*

Figure 66: Frequency of Skeletal Stress Indicators in Females (Roman West)



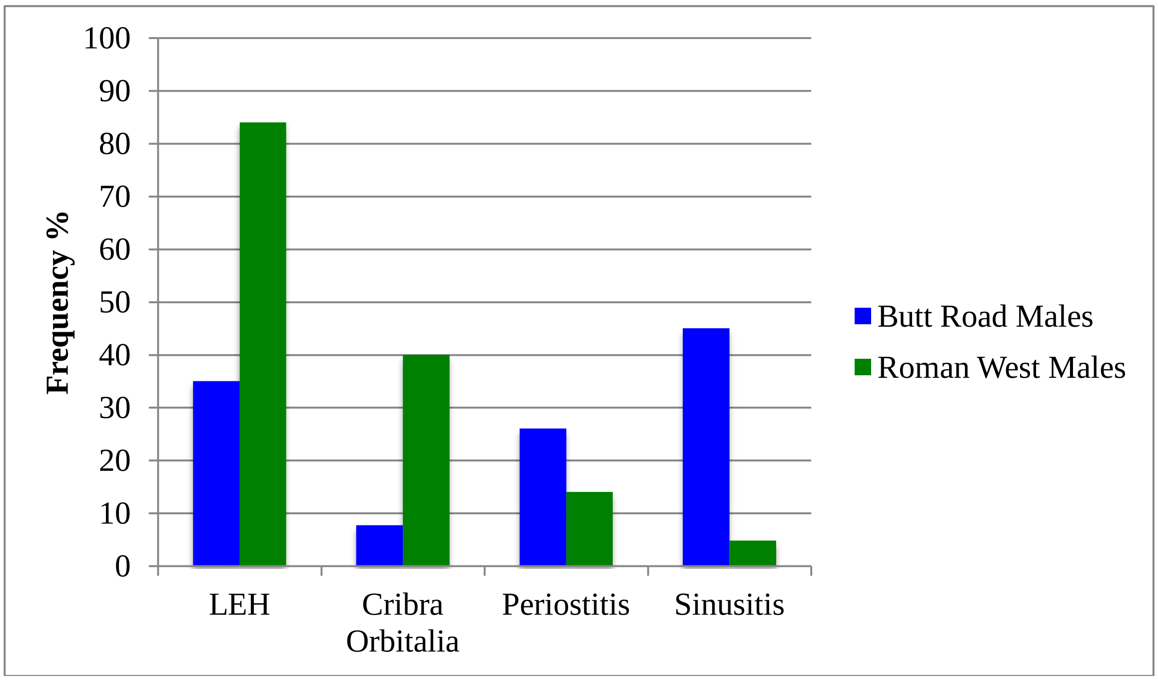
Adult Males

The results for adult males are very similar to adult females. Table 60 presents the frequency of health indicators for London Roman West adult males. There are significant differences in the presence of cribra orbitalia (χ^2=9.82 df=1), LEHs (χ^2=14.86 df=1), and maxillary sinusitis (χ^2=9.95 df=1). Again, London Roman West has much more cribra orbitalia and LEH than Butt Road, while sinusitis is much more prevalent in the Butt Road sample. There is no significant difference in periostitis (χ^2=1.41 df=1). Figure 67 shows the frequency of health indicators for adult males.

Table 60: Skeletal Stress Indicators in Roman West Males

Pathology	Present	Absent	Total	Frequency %
LEH	21	4	25	*84*
Cribra Orbitalia	10	15	25	*40*
Periostitis	4	24	28	*14*
Sinusitis	1	20	21	*4.8*

Figure 67: Frequency of Skeletal Stress Indicators in Males Roman West)



Long Bone Lengths

Table 61: Roman West Maximum Femur Length

Sex	Number	Minimum	Maximum	Mean	St. Dev.
Male	6	431	495	463.3	27.7
Female	4	404	465	429.5	27.5

Table 62: Roman West Maximum Tibia Length

Sex	Number	Minimum	Maximum	Mean	St. Dev.
Male	8	327.5	387.0	344.4	21.4
Female	6	309.0	359.0	328.5	18.0

Independent t-tests are used to compare long bone lengths between London Roman West and the Butt Road sample. No significant differences were found between females for maximum femur length. There is a significant difference between male maximum femur lengths. There are no significant differences in male and female maximum tibia length. The small sample size of individuals with intact long bones in London Roman West may contribute to these results. However, both males and females from London Roman West have greater mean maximum femoral lengths than Butt Road males and females.

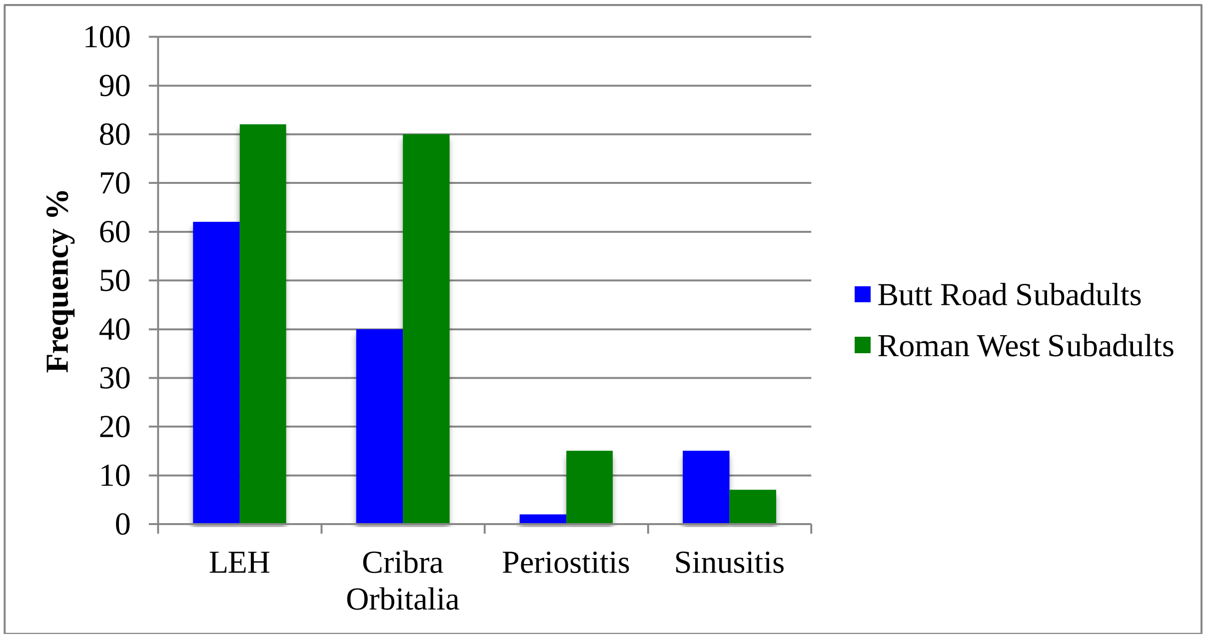
Subadults

The frequency rates of health indicators for London Roman West cemetery subadults are shown in Table 63. When compared to the Butt Road subadult sample found in the previous section, the frequency rate for health indicators is higher with the exception of maxillary sinusitis. Pearson's chi-square and Fisher's exact test are used to test for significance at the $p=0.05$ levels. There is a significant difference in the presence of cribra orbitalia ($\chi^2=7.73$ df=1). London Roman West subadults have a much higher frequency of cribra orbitalia than Butt Road subadults. However, there are no significant differences between LEHs ($\chi^2=2.11$ df=1), periostitis ($p=0.15$) or maxillary sinusitis ($p=0.6$). Figure 68 shows the frequency of each indicator of stress for both samples.

Table 63: Skeletal Stress Indicators in Roman West Subadults

Pathology	Present	Absent	Total	Frequency %
LEH	14	3	17	*82*
Cribra Orbitalia	12	3	15	*80*
Periostitis	4	23	27	*15*
Sinusitis	1	14	15	*7*

Figure 68: Frequency of Skeletal Stress Indicators in Subadults (Roman West)



Comparing Butt Road and the Bath Gate Cemetery

Adults

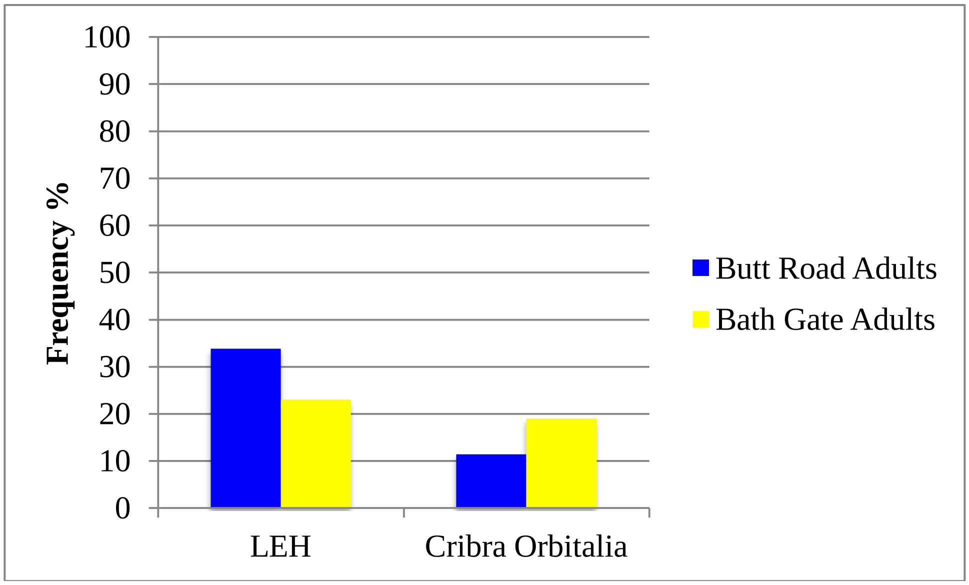
The frequency rates of skeletal indicators for adults from Bath Gate are summarized in Table 64. When compared to the Butt Road cemetery, Bath Gate adults have much more similar frequency rates than either of the London samples. There is no significant difference in the presence of cribra orbitalia (χ^2=2.48 df=1) or LEHs (χ^2=3.11 df=1). As mentioned previously, it is not possible to compare periostitis and sinusitis rates in the Bath Gate cemetery.

Table 64:Skeletal Stress Indicators in Bath Gate Adults[1]

Pathology	Present	Absent	Total	Frequency %
LEH	41	136	177	*23*
Cribra Orbitalia	40	168	208	*19*
Periostitis	24			
Sinusitis	7			

[1] In the Bath Gate sample, LEHs are based on the dental inventories reported in the microfiche appendices. Cribra orbitalia is reported by orbits instead of individuals in the Wells (1982) bone report. The number of individuals with periostitis and sinusitis are reported in the 1982 bone report. The number of individuals observable for these stress indicators was not reported in the 1982 bone report.

Figure 69: Frequency of Skeletal Stress Indicators in Adults (Bath Gate)



Adult Females

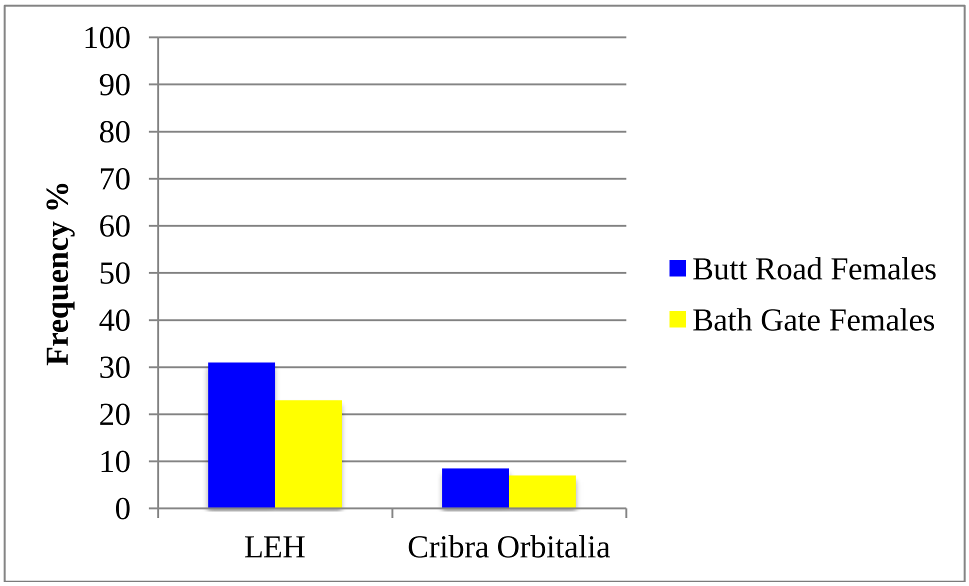
When adult females are compared, Bath Gate females have the lowest skeletal stress indicator rates of all the samples. Only 7% of Bath Gate females were affected by cribra orbitalia and 23% had evidence of LEHs. In contrast, 8.5% of Butt Road females had cribra orbitalia and 31% were affected by LEHs. However there is no significant difference in cribra orbitalia (Fisher's Exact test p=0.18) or LEHs (χ^2 =0.75 df=1) between adult females from both sites.

Table 65: Skeletal Stress Indicators in Bath Gate Females[1]

Pathology	Present	Absent	Total	Frequency %
LEH	12	40	52	*23*
Cribra Orbitalia	10	47	57	*7*
Periostitis	7			
Sinusitis	3			

[1] In the Bath Gate sample, LEHs are based on the dental inventories reported in the microfiche appendices. Cribra orbitalia is reported by orbits instead of individuals in the Wells (1982) bone report. The number of individuals with periostitis and sinusitis are reported in the 1982 bone report. The number of individuals observable for these stress indicators was not reported in the 1982 bone report.

Figure 70: Frequency of Skeletal Stress Indicators in Females (Bath Gate)



Adult Males

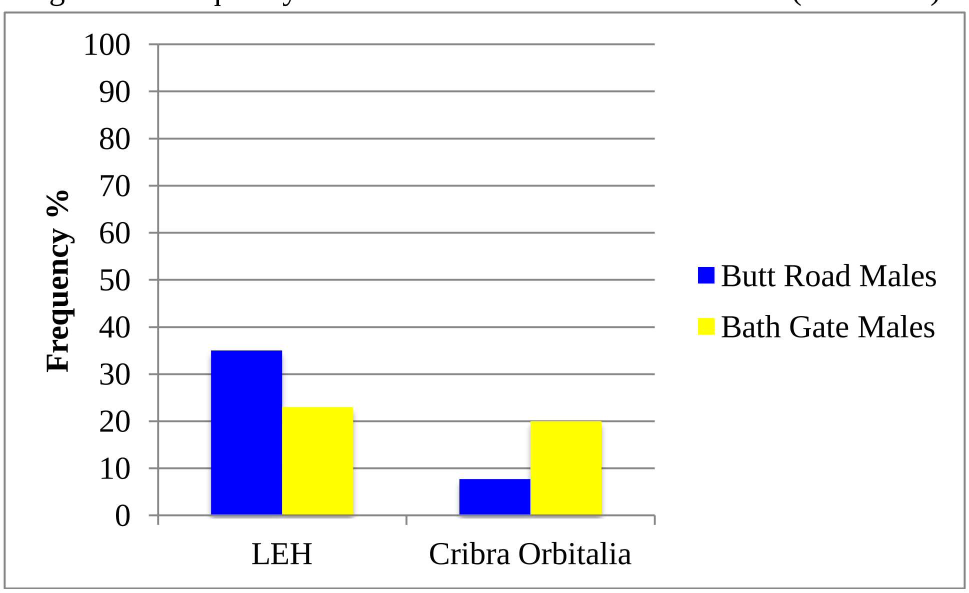
When adult males from both sites are compared Butt Road males appear to have better access to vitamin rich foods. Only 7.7% of Butt Road males are affected by cribra orbitalia while 20% of Bath Gate males are affected. However 35% of Butt Road males have LEHs while only 23% of Bath Gate males have LEHs. This difference in frequency is not a significant between the samples for cribra orbitalia (χ^2=3.2 df=1) or LEHs (χ^2 =2.19 df=1). However, it does suggest that males at Bath Gate may have been affected more frequently by dietary deficiencies as older children or adults while Butt Road males experienced physiological stress early in childhood (from weaning or childhood diseases) but received adequate nutrition as they got older.

Table 66: Skeletal Stress Indicators in Bath Gate Males[1]

Pathology	Present	Absent	Total	Frequency %
LEH	29	96	125	*23*
Cribra Orbitalia	30	121	151	*20*
Periostitis	17			
Sinusitis	4			

[1] In the Bath Gate sample, LEHs are based on the dental inventories reported in the microfiche appendices. Cribra orbitalia is reported by orbits instead of individuals in the Wells (1982) bone report. The number of individuals with periostitis and sinusitis are reported in the 1982 bone report. The number of individuals observable for these stress indicators was not reported in the 1982 bone report.

Figure 71: Frequency of Skeletal Stress Indicators in Males (Bath Gate)



Long Bone Length

Table 67: Bath Gate Maximum Femur Length

Sex	Number	Minimum	Maximum	Mean	St. Dev.
Male	122	325.2	500.7	450.96	21.5
Female	43	208.8	465.4	417.7	37.9

Table 68: Bath Gate Maximum Tibia Length

Sex	Number	Minimum	Maximum	Mean	St. Dev.
Male	108	257.1	412.1	360.1	22.5
Female	40	299.3	367.8	333.3	17.7

Independent t-tests were used to identify differences in long bone length between the Butt Road sample and Bath Gate. There is a significant difference in the maximum length of femur in males (t= -2.26 df=147). There is not a significant difference between female maximum femur lengths. There was no significant difference in maximum length of tibia in males or in females.

Subadults

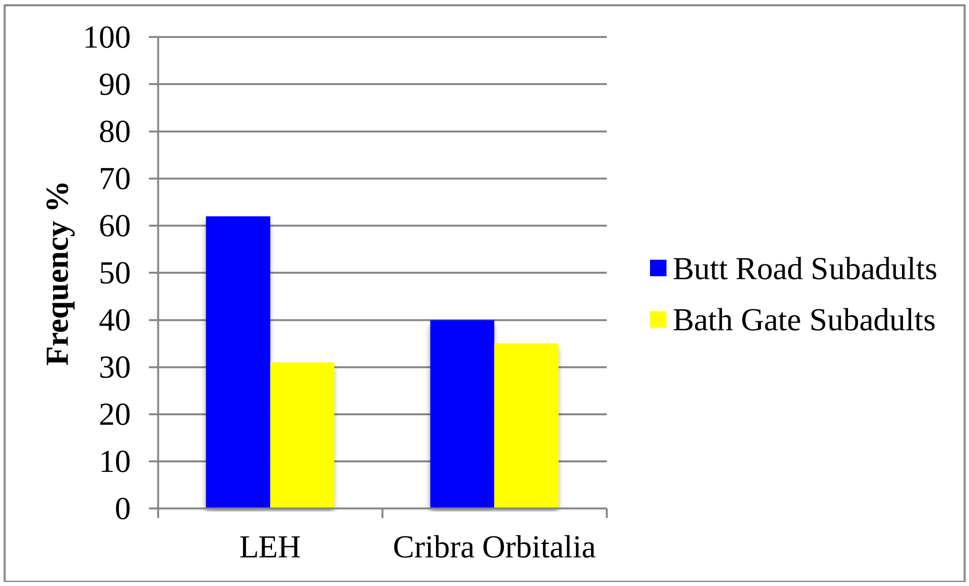
When subadults from Butt Road and Bath Gate are compared the trend seen in adults continues. Cribra orbitalia is much lower in both of these samples than in the London samples. Only 35% of Bath Gate subadults and 40% of Butt Road subadults have evidence for cribra orbitalia. More Butt Road subadults are affected by LEHs (62%) than Bath Gate subadults (31%). However, as previously mentioned, the Bath Gate subadult sample contains for more infants than the other subadult samples and these individuals did not live long enough to develop cribra orbitalia or LEHs. Despite the age differences in these samples, there is not a significant difference in cribra orbitalia levels between the two samples (χ^2= 0.18 df=1) or LEHs (χ^2 = 3.28 df=1).

Table 69: Skeletal Stress Indicators in Bath Gate Subadults

Pathology	Present	Absent	Total	Frequency %
LEH	4	9	13	*31*
Cribra Orbitalia	13	24	37	*35*
Periostitis	2			
Sinusitis	0			

[1] In the Bath Gate sample, LEHs are based on the dental inventories reported in the microfiche appendices. Cribra orbitalia is reported by orbits, instead of by individuals in the Wells (1982) bone report. The number of individuals with periostitis and sinusitis are reported in the 1982 bone report. The number of individuals observable for these stress indicators was not reported in the 1982 bone report.

Figure 72: Frequency of Skeletal Stress Indicators in Subadults (Bath Gate)



Skeletal Stress from a Regional Perspective

The goal of this comparison is to develop a regional perspective of skeletal stress in Romano-British towns. The results of this comparison suggest that community size, type, and organization play a major role in population health. In addition, local environmental conditions, such as access to clean water, house style, and waste disposal, must also be considered. The results indicate that the individuals in the London samples probably suffered from the most biocultural stress as children but the presence of stress indicators did not overly affect long bone growth.

Cribra orbitalia was most frequent in all demographic groups from the London samples. As mentioned in Chapter Three, Walker et al. (2009) attribute cribra orbitalia to vitamin deficiency due to an inadequate diet. The results for cribra orbitalia indicate that both subadults and adults from London had high frequencies of cribra orbitalia in comparison to the Bath Gate and Butt Road samples. Subadults appear to be most physiologically vulnerable to developing cribra orbitalia but the high frequency of cribra orbitalia in adults in London is surprising given the low frequencies in the other two samples. When only subadults are considered, 100% of London Roman South subadults and 80% of London Roman West subadults are affected by cribra orbitalia while only 40% of Butt Road subadults and 35% of Bath Gate subadults are affected. In the case of Bath Gate, 30% of the subadult sample is infants so this may not provide an accurate picture of subadult nutritional stress in Cirencester. However, the Butt Road and London samples are primarily represented by children old enough to have developed cribra orbitalia. The lower frequency of cribra orbitalia at Butt Road suggests that children living in and around Colchester had better access to adequate nutrition than children living in or around London. Adults are generally less susceptible to cribra orbitalia than subadults, so it is surprising that so many adults from London were also affected compared to the other samples.

Due to small sample sizes involved, this study does not breakdown cribra orbitalia into active, healed, or mixed reaction. Yet even if the cribra orbitalia in adults in London is not active this suggests that these individuals were affected by inadequate nutrition for longer periods of time or were less able to remodel bone than the other adult samples. Cribra orbitalia affected 72% of London Roman South adults and 49% of London Roman West adults. In comparison only 11.4% of adults were affected in the Butt Road samples and 19% of adults in the Bath Gate sample. As with subadults, it seems that poor nutrition was more frequent in London adults than in the other samples.

Linear enamel hypoplasias (LEH) are an indicator of stress in early childhood. As with cribra orbitalia, the samples from London experienced higher levels of stress in early childhood than the samples from Butt Road and Bath Gate. As mentioned previously, 75% of adults and 86% of subadults from London Roman South, and 76% of adults and 82% of subadults from London Roman West have at least one LEH. In contrast, 34% of adults and 62% of subadults from Butt Road have at least one LEH. The Bath Gate sample had the lowest level of LEH with 23% of adults and 31% of subadults with at least one LEH. Again, the Bath Gate data for LEHs is problematic and the higher number of infants in this sample may also distort the results of this study, as they did not live long enough to develop LEHs.

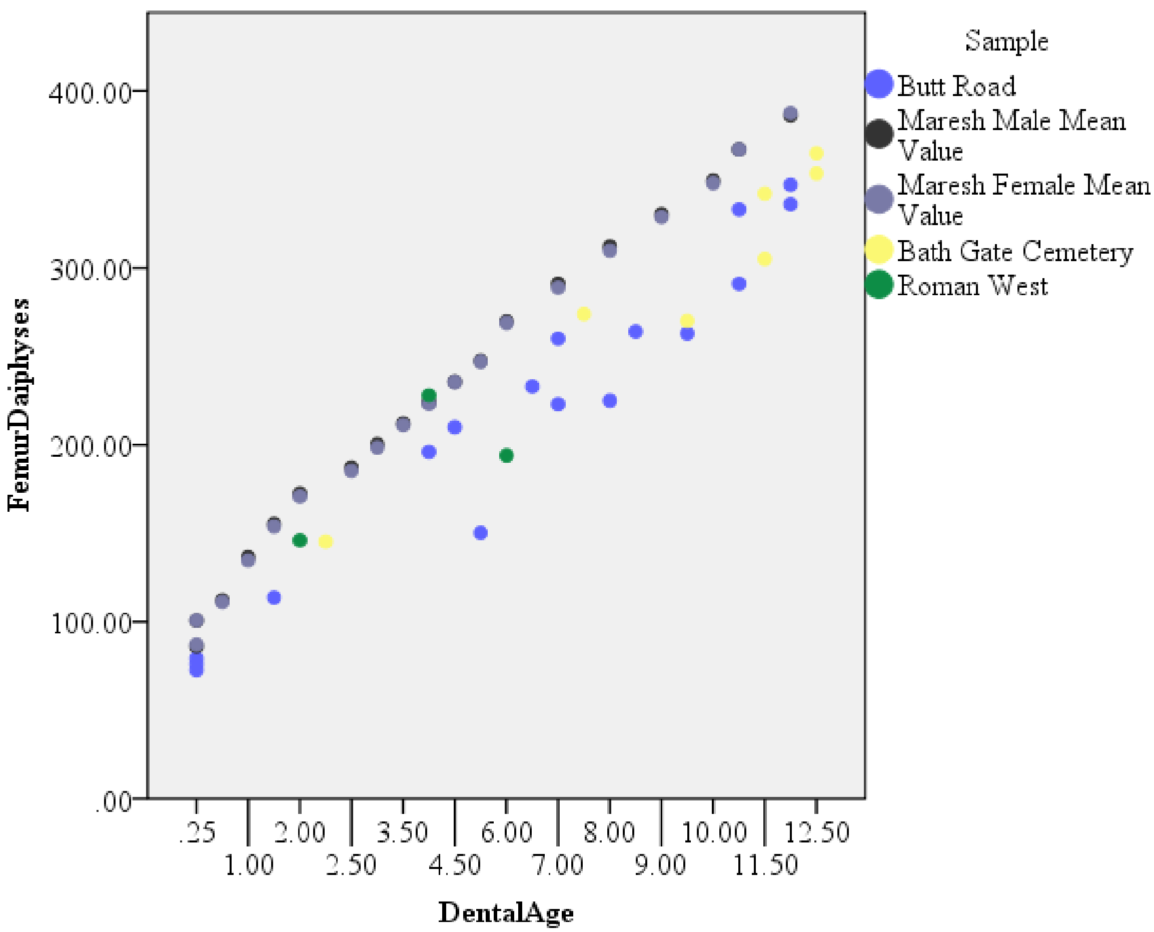
Periostitis was relatively rare in the samples that could be compared. Preservation of the cortical surface of long bones likely contributed to this result. Maxillary sinusitis is observed in each of these samples although Butt Road has the highest frequency. The results for maxillary sinusitis are problematic because only the Butt Road sample included observations for maxillary sinusitis for all individuals in the research design. The comparative data from the London cemeteries and Bath Gate is problematic because only individuals with maxillary sinusitis are recorded and there is little or no information regarding the presence of observable sinuses not affected by maxillary sinusitis in these samples. However, the presence of several cases from each of the comparative samples suggests that indoor air quality was poor in all of these communities.

A comparison of long bone length of adults and femoral diaphyseal length of subadults also suggests differences in these communities. One-way ANOVA found no significant differences in the distribution of maximum femora and tibiae lengths between females from all four sites. However, there was a significant difference in the distribution of maximum femora length for males. Butt Road had the smallest mean for maximum femur length at 440.4mm (n=27), while London Roman West had the largest male maximum femur length mean at 463mm (n=6), and Bath Gate males fell in between these two samples with a mean of 451mm (n=122).

It is interesting that London has the highest frequencies of skeletal stress indicators even in males, yet these males seem to have "recovered" in terms of long bone length compared to Butt Road and Bath Gate, which have more equal frequencies of skeletal stress indicators but are smaller in stature. While females did not have a significant difference in distribution, the mean maximum femoral lengths for each sample follow a similar pattern as males. Butt Road females have the smallest mean at 403mm (n=12), Bath Gate 417.7 (n=43) while London Roman West is 429.5mm (n=4) and London Roman South is 434.4 (n=4). The differences in long bone length in males and females between these sites may suggest population origin differences. Unfortunately, there is currently no stable isotope or ancient DNA data available for all of these samples to study population origin. This analysis would greatly contribute to the understanding of population movement in the Late Roman Empire.

The trend seen in long bones of adults between samples is also present in diaphyseal length of subadult femora. The scatter plot below compares the subadults with available femoral diaphyseal lengths and dental ages from Butt Road, Bath Gate and London Roman West with the modern male and female means from the Maresh (1970) data. Only a few subadults are available from each comparative site making it difficult to identify trends. However, the individuals from London Roman West have a diaphyseal length nearly equal to modern children. Subadults from Butt Road and Bath Gate fall below modern children in terms of diaphyseal length at each age group. Although the number of subadults with available measurements and dental age from Bath Gate is small, there does appear to be a trend for Bath Gate subadults to have slightly greater diaphyseal lengths than Butt Road subadults of similar ages. As with adults, this seems to suggest a difference in population rather than skeletal stress stunting growth.

Figure 73: Femoral Diaphyseal Length vs. Dental Age Estimates (Inter-Site)



Implications of Comparative Results

The cemeteries selected for comparison are all associated with towns but the role of each town within Roman Britain may affect the comparison of health between these samples. Roman Colchester appears to be a more stable community than London or Cirencester. As the political and economic center of Roman Britain, London likely had a greater amount of population migration to the town. As a result differential access to resources was likely more pronounced in Roman London. There also appears to be a difference in between London Roman South and London Roman West that may be related to the segments of London's population using each cemetery. A more detailed mortuary analysis of these cemeteries could aid in the understanding of possible social differences between these cemeteries.

Roman Colchester and Cirencester served as regional economic centers and there is some evidence that Cirencester was a regional political center as well. Cirencester also appears to have ties to the military. The demographic profile of Bath Gate is very different from the other cemeteries in this comparison. It has a disproportionate number of males in comparison to the other cemeteries and more cases of trauma (including evidence for sharp force trauma and decapitations). Subadults and females are underrepresented in the sample. This seems to suggest that the Bath Gate cemetery was not used by the regular community at Cirencester and instead may contain Roman soldiers or auxiliary troops and perhaps their spouses and children. A detailed study of this site, including a reanalysis of all skeletal material and a mortuary analysis of the cemetery organization, is needed to better understand the unique mortuary pattern present at this site.

In regard to a "normal" town population, Colchester appears to have been able to buffer biocultural and environmental stressors better than London. As described in Chapter Four, the

Colchester sample reflects a generally “healthy” population. Both adults and subadults experienced relatively low levels of skeletal stress in comparison with the London skeletal samples. The Bath Gate sample also appears to have low levels of biocultural stress but it appears to represent a specific segment of the town or area population rather than the community at large. The next chapter will incorporate these results into a discussion on mortuary change in health in the Late Roman Empire.

Chapter 8 Discussion and Implications

Introduction

This dissertation has four main goals. It explores changes in skeletal stress over time within the Butt Road cemetery by comparing Period 1 and Period 2. Then it examines the spatial distributions of skeletal and mortuary variables within the cemetery to gain insight into aspects of individual and group identity. As part of the mortuary analysis, the criteria for the identification of Christian graves suggested by Watts (1991) are reexamined incorporating broader perspectives on the roles of agency and identity in Late Roman burials. Finally, to better understand how local identity and environment can influence skeletal stress, the Butt Road cemetery is compared to three contemporaneous cemeteries from London and Cirencester. The results presented in the previous chapters (Chapter Four: Skeletal Results of the Butt Road Sample, Chapter Five: Mortuary Results of the Butt Road sample and Chapter Seven: Inter-site Skeletal Results) provide detailed information for each of these research goals. This chapter focuses on integrating the results of this study into a discussion of skeletal stress and local identity in Roman Britain.

Evaluating Skeletal Stress Over Time

One of the goals of this study is to examine biocultural stress within the Roman period in Britain. The spread of the Roman Empire had a profound effect on the social organization and living conditions of the people within the new Roman territories. Following military conquest, new Roman provinces underwent the process of developing a local identity by integrating Roman cultural concepts and urban design with existing beliefs and landscapes (Revell, 2009). This period of conquest and occupation must have been incredibly stressful from both social and environmental perspectives, and for this reason it is not surprising that previous studies have found significant differences in the levels of physiological stress experienced in the Roman period in comparison with the Late Iron Age. Peck (2009) and Roberts and Cox (2003) concluded that the invasion of Britain resulted in negative biological consequences including increased skeletal stress and higher rates of trauma. However, after local Roman communities became well established, physiological stress levels may have been reduced as people adapted to life within this new system. This study examines possible differences in physiological stress levels over time by comparing Period 1 to Period 2 in the Butt Road sample.

While the less than optimal preservation for the burials in Period 1 makes it difficult to compare some stress indicators, the results of this study suggest the level of physiological stress experienced by individuals buried at the Butt Road cemetery remained fairly constant over time. Contrary to the expectations described in Chapter Two, there are no significant differences in skeletal stress indicators at the p=0.05 level between Period 1 and Period 2. Table 70 summarizes the results of this comparison. The poor bone preservation in Period 1 made many individuals unobservable for several skeletal stress indicators resulting in a skeletal sample that does not necessarily reflect the skeletal stress experienced by individuals living in the 1st to 3rd centuries in and around Roman Colchester.

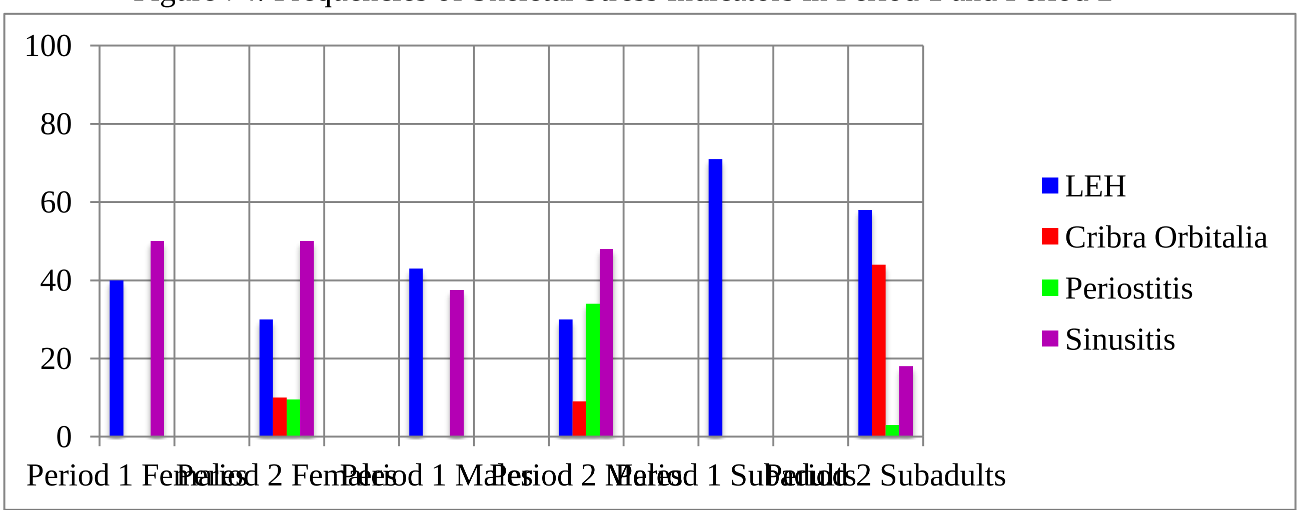
Despite a lack of statistical significance, there are several interesting trends visible in the comparison between Period 1 and Period 2 (Figure 74). The frequency of LEHs in Period 1 males, females, and subadults is greater than Period 2 males, females, and subadults. For example, 71% of Period 1 subadults have LEHs present while only 58% of Period 2 subadults have LEHs present. This trend suggests that individuals in Period 1 may have experienced slightly more stress in early childhood than individuals from Period 2. Immune responses to non-specific infections such as maxillary sinusitis appear to be quite similar between the temporal periods. Maxillary sinusitis can represent both respiratory and dental health. It can be difficult to distinguish which disease process is responsible for these infections. However, this type of infection primarily affects adult males and females in both temporal periods but subadults are rarely affected. This pattern suggests that these types of infections developed over the course of a person's lifetime, likely due to long-term exposure to poor indoor air conditions and the development of dental disease.

Table 70: Summary of Temporal Comparison Results[1]

	Period 1 vs. Period 2			
	Adults	**Females**	**Males**	**Subadults**
LEH	-	-	-	-
Cribra Orbitalia	-	-	-	-
Periostitis	-	-	-	-
Sinusitis	-	-	-	-
Long Bone Length		-	-	

[1] A plus sign (+) indicates a significant result at the p=0.05 level. A minus sign (-) indicates no significant difference. An empty cell indicates no comparison is made

Figure 74: Frequencies of Skeletal Stress Indicators in Period 1 and Period 2



Evaluating Physiological Stress Levels Within Temporal Periods

In addition to examining skeletal stress between Period 1 and Period 2, skeletal stress differences are also examined between demographic groups in the Butt Road cemetery. Males and females are compared to see if, over the course of their lifetimes, males and females experienced different levels of stress, which could be a result of differential access to care, food, or other resources. In Period 1, only LEHs and sinusitis can be compared for males and females. There are no significant differences between Period 1 males and females for these stress indicators. The skeletal sample from Period 2 provides more insight into differences between males and females due to its larger size and better preservation. Table 71 and Figure 75 summarize the results these comparisons.

When adult males and females from Period 2 are compared, there are relatively few differences in the frequencies of skeletal stress indicators. Males and females have similar rates of cribra orbitalia and LEHs. The similarities in frequency of LEH and cribra orbitalia in males and females from the Butt Road cemetery suggest that they received similar care and access to an adequate diet as children. Cribra orbitalia is rare in adult males and females. This seems to suggest that most adults recovered from dietary stress experienced in childhood and any evidence for cribra orbitalia had remodeled by the time of their deaths.

As individuals aged, they became more likely to develop non-specific infections such as periostitis of the tibia and maxillary sinusitis. Only one subadult in Period 2 has evidence for periostitis and only three subadults have evidence of sinusitis. This suggests that long-term exposure to poor indoor air quality, the development of dental disease, and the transition to adult occupations and work-loads played a role in the development of these types of infections.

The nearly equal levels of maxillary sinusitis in males and females from the Butt Road cemetery suggests that both males and females probably spent relatively large amounts of time indoors and as a result were probably exposed to air pollutants such as smoke, dust, and fungal spores (Roberts, 2007). Dental health can also contribute to maxillary sinus infections either directly through oro-antral fistulas into the sinus or through the spread of infection from the oral cavity to the nasal cavity and eventually to the sinuses via the pharynx. While dental health is not a primary focus of this study, dental infections do appear to contribute to some of the sinusitis visible in males and females from the Butt Road cemetery.

While males and females have nearly equal rates of sinusitis, there is a significant difference in the presence of periostitis of the tibia between males and females in Period 2. Males have far more periostitis, but it is unclear why there is such a distinct difference between males and females. They appear to have similar immune responses to other infections such as maxillary sinusitis so perhaps differences in occupation may contribute to these infections. Studies of Roman economics and labor suggest that females were primarily responsible for maintaining the household, caring for children, textile production, and cooking. Men were the primary agricultural and industrial labor force and as a result were probably more likely to suffer injuries that could result in periosteal infections (Roth, 2007).

Overall, the Butt Road sample appears to reflect a relatively 'healthy' population that experienced low levels of physiological stress. Males and females appear to have received equal access to care and nutrition as children. As individuals matured, they became more susceptible to non-specific infections related to occupation and living conditions. By examining the osteobiographies of selected individuals, it is possible to find a wide amount of variation in stress levels within this sample.

As described in Chapter Six, individuals buried in the Butt Road cemetery had diverse life experiences. Grave 601, a middle-aged male, does not appear to have experienced high stress levels as a child. He has no evidence for LEHs on his anterior teeth and his eye orbits are also normal. However, as Grave 601 aged, he began to develop degenerative conditions including osteoarthritis in his zygopophyseal joints, severe dental caries and antemortem tooth loss. His poor dental health may have contributed to the development of an infection in his left maxillary sinus. In contrast, Grave 174, an adult female, appears to have experienced stress early in childhood, indicated by bilateral LEHs on her maxillary canines and mandibular central incisors. However, as an adult she did not suffer from infections or poor dental health.

Trauma to the skeleton appears to be quite rare in this sample but one individual, Grave 622, provides one of the few examples of trauma in this sample. Grave 622, a middle aged male appears to have had a 'healthy' childhood, with no evidence for cribra orbitalia or LEHs. However as an adult, Grave 622 fractured his right tibia. Although the fracture healed, it was poorly aligned which resulted in noticeable shortening of the tibia. A periosteal infection also developed in associated with the fracture on his right tibia and fibula. In addition to this fracture, Grave 622 also had evidence of a respiratory infection in his frontal sinus.

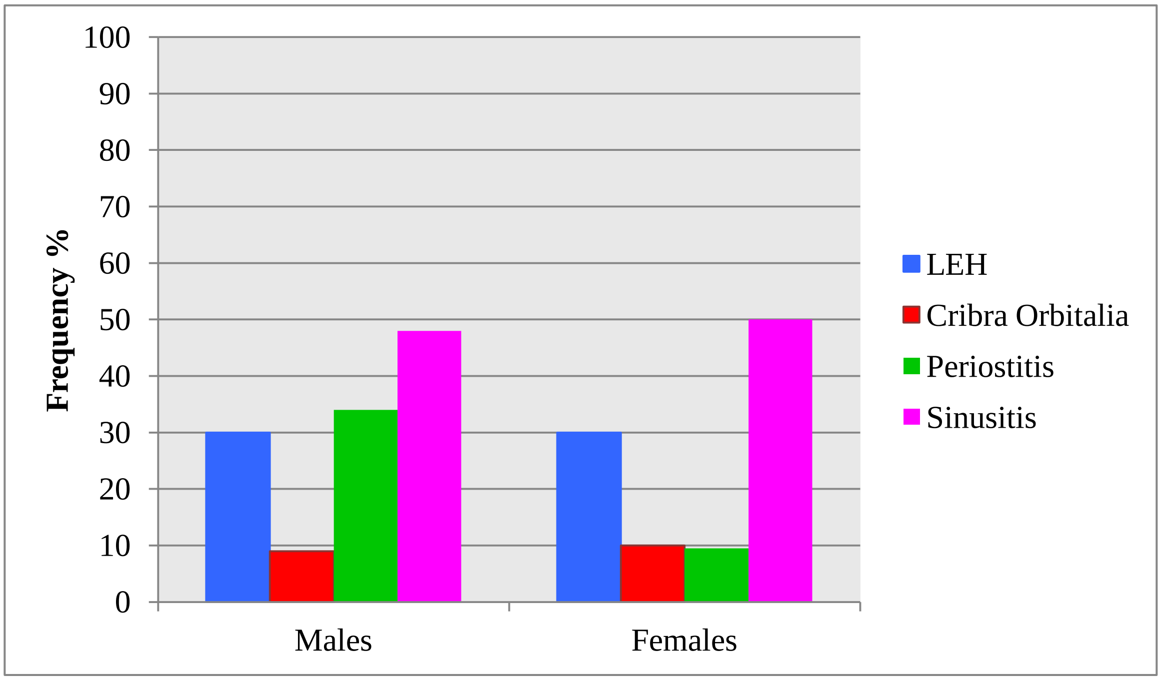
By examining the individual skeletons from this sample, it is possible to develop a sense for the range of experiences and skeletal stress within the Butt Road cemetery. While the individuals highlighted here did have some indicators of skeletal stress, other individuals from the sample have no evidence for skeletal stress over the course of their lifetimes. Differences in mortuary treatment between individuals may also provide insight into differences in individual and group identity.

Table 71: Summary of Period 2 Males vs. Females Results[1]

Skeletal Stress Indicator	Period 2 Males vs. Females
LEH	-
Cribra Orbitalia	-
Periostitis	+
Sinusitis	-

[1]Plus symbols (+) indicate significant difference at the p=0.05 level between Period 2 males and females. Minuses (-) indicate no significant differences.

Figure 75: Frequency of Skeletal Stress Indicators in Period 2 by Sex



Mortuary Treatments and Spatial Distributions at Butt Road

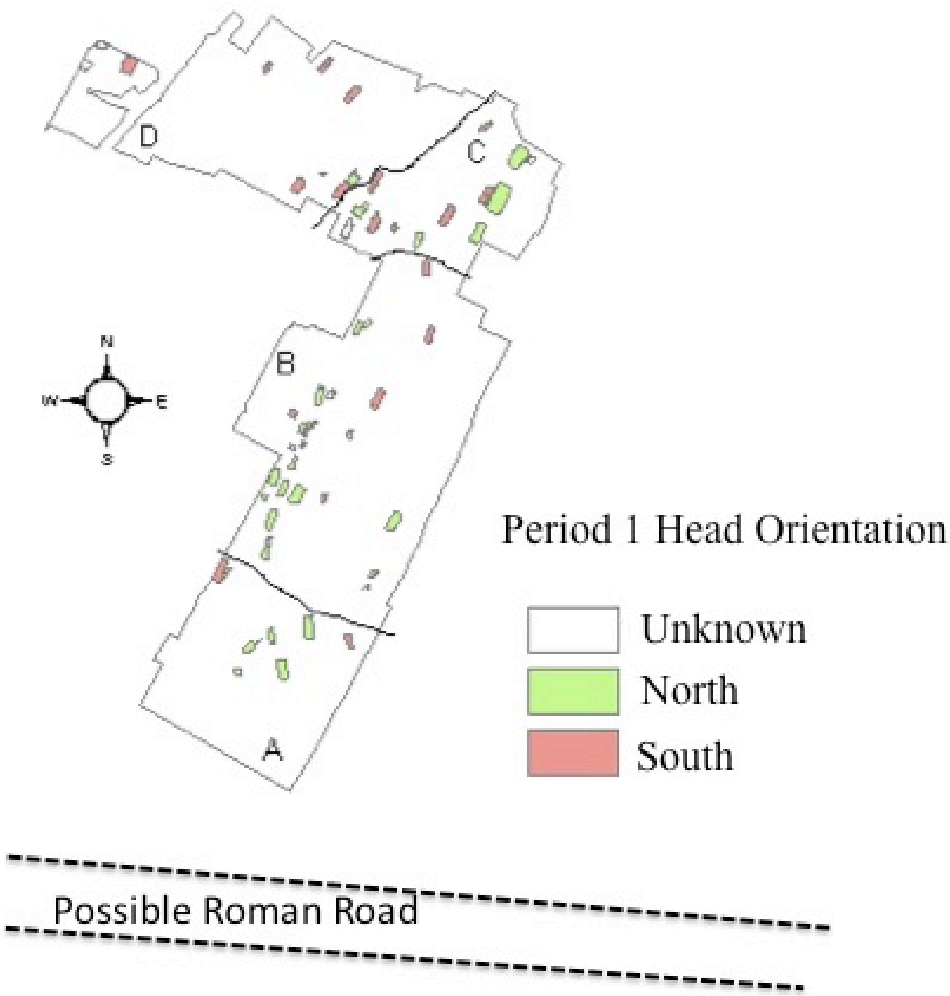
The Butt Road cemetery also provides the opportunity to examine change in mortuary practices over time. The cemetery reflects a change in mortuary practices and grave orientation in the late 3rd or early 4th centuries. This shift in burial practices has been noted in other Romano-British cemeteries but it is unclear what social factors are responsible for these changes within the cemetery.

Period 1

Period 1 spans the 1st-3rd centuries AD, although most Period 1 graves appear to date to the 3rd century AD. One undisturbed cremation was recovered from Period 1, but the rest of the graves were inhumations. Most individuals were buried supine in wooden coffins or shrouds.

Period 1 graves are oriented north-south, and they appear to have a relationship with a possible road running along the south edge of the cemetery (Figure 76). Head orientation within Period 1 appears to be related to focal points outside of the cemetery. Graves located at the southern portion of the cemetery have their heads oriented to the north 'facing' the probable road while individuals buried at the northern portion of the cemetery have their heads to the south. Grave goods were quite common in Period 1; 28 graves of the 61 excavated contained grave goods (47%). Grave goods in Period 1 include pottery, footwear, glass vessels, and personal adornment items. Both adults and subadults were buried with grave goods.

Figure 76: Period 1 Head Orientation in Relation to Roman Road



Period 2

In the late 3rd or early 4th centuries AD, the cemetery appears to undergo a shift in organization. All Period 2 graves are oriented east west and graves become densely packed together. Within Period 2, there is a slight shift in grave orientation that may represent burial phases within this temporal phase. The reasons for this shift are not explored in this dissertation as it focuses on the larger temporal differences between Period 1 and Period 2. In addition to this shift in grave orientation, there is also increased regularity in head orientation. Almost all individuals were buried with their heads to the west except for two individuals at the south edge of the cemetery with their heads to the east.

Most individuals in Period 2 were buried in simple wooden coffins and did not include grave goods. In Period 2, only 22 graves of the 153 sampled included grave goods. Only 7% of males and 8% of females were buried with grave goods. However, 20% of subadults in Period 2 were buried with grave goods. Personal adornment items are the most frequent type of grave good included in Period 2 and are often associated with children. Pottery, glass, and footwear were rarely included and are primarily associated with adults. Grave goods appear to be linked to individual or group identity but may not be a reliable indicator of socioeconomic status in the Butt Road sample. Table 72 summarizes the results of the comparison between Period 1 and Period 2.

Table 72: Summary of Butt Road Mortuary Results [1]

Mortuary Variables	Period 1 vs. Period 2
Grave Goods Presence	+
Personal adornment items	-
Glass vessels	-
Pottery	+
Footwear/hobnails	+

[1]Plus symbols (+) indicate significant differences at the p=0.05 level between the Butt Road sample and the comparative sample. Minuses (-) indicate no significant differences.

Spatial Distributions of Mortuary Variables

When the spatial distributions of grave good presence and type are examined there are some interesting patterns. High/Low cluster analysis results indicate that the distribution of grave goods in Period 1 is random, but in Period 2 grave goods were clearly clustered. When types of graves are examined only personal adornment items appear to be clustered in Period 1. In Period 2, personal adornment items and glass are clustered but other types of grave goods, such as pottery, are still randomly distributed through the cemetery.

In both temporal periods, the southern end of the cemetery (area A) has the highest frequency of graves with grave goods. This may indicate that area A was a preferential burial area for higher status individuals within the community. However, the presence of atypical burials on the edge of area A, including a decapitated individual, may suggest that some individuals were buried outside the boundaries of the normal community cemetery as a warning to the living and a punishment for some transgression or crime of the deceased (Duncan, 2005).

Table 73: Summary of High/Low Cluster Analysis of Mortuary Variables

High/Low Cluster (Getis Ord General G) Results		
	Period 1	**Period 2**
Grave Goods Presence	Random	High Clusters
Personal adornment items	High Clusters	High Clusters
Glass	Random	High Clusters
Pottery	Random	Random
Footwear	Random	Random

Spatial Distributions by Skeletal Health, Age, and Sex

The distribution of skeletal stress indicators within the Butt Road cemetery suggests that this sample shared the same general socioeconomic status (Table 74). The distribution of LEHs, cribra orbitalia, periostitis, and maxillary sinusitis are random and occur in all areas of the cemetery. The presence or absence of grave goods does not appear to affect the distribution of skeletal stress. Instead, the distribution of some skeletal stress indicators appears to be influenced by the distribution of age and sex within the cemetery. The distribution of males, females, and subadults is also random although there appears to be a tendency for subadults to be buried near one another.

Skeletal Stress Indicators

Cribra orbitalia primarily affects subadults in this sample and this is reflected in the spatial distribution of this stress indicator. Surprisingly, 6/9 or 67% of subadults buried with grave goods were affected by cribra orbitalia. Only 8/34 or 24% of subadults buried without grave goods were affected by cribra orbitalia. While the presence of grave goods in subadult graves may be related to families mourning the loss of a child, these grave goods may also indicate that these children came from families of higher socioeconomic status. This suggests, somewhat counter-intuitively, that high status children may have been at a disadvantage nutritionally.

Figure 77: Period 2 Subadults with Grave Goods and Cribra Orbitalia

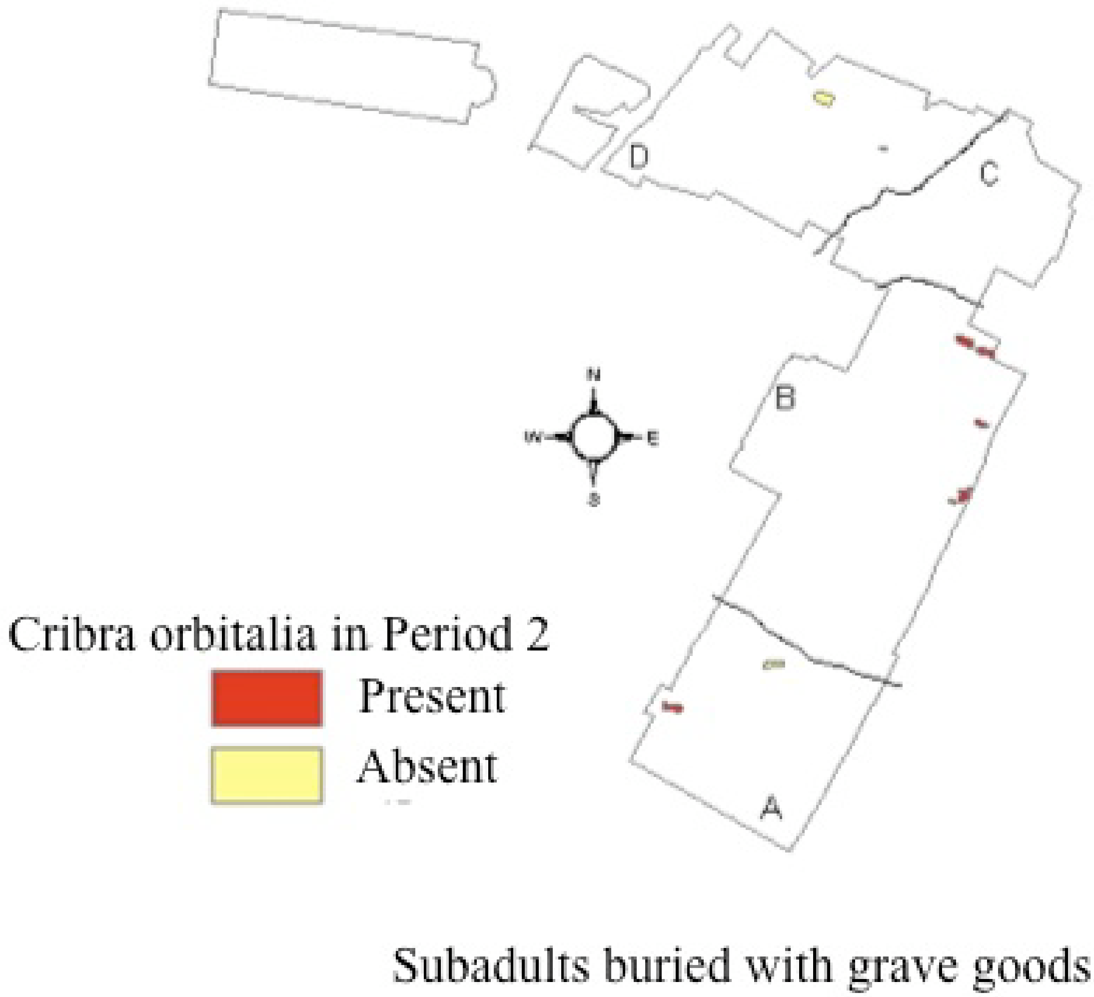
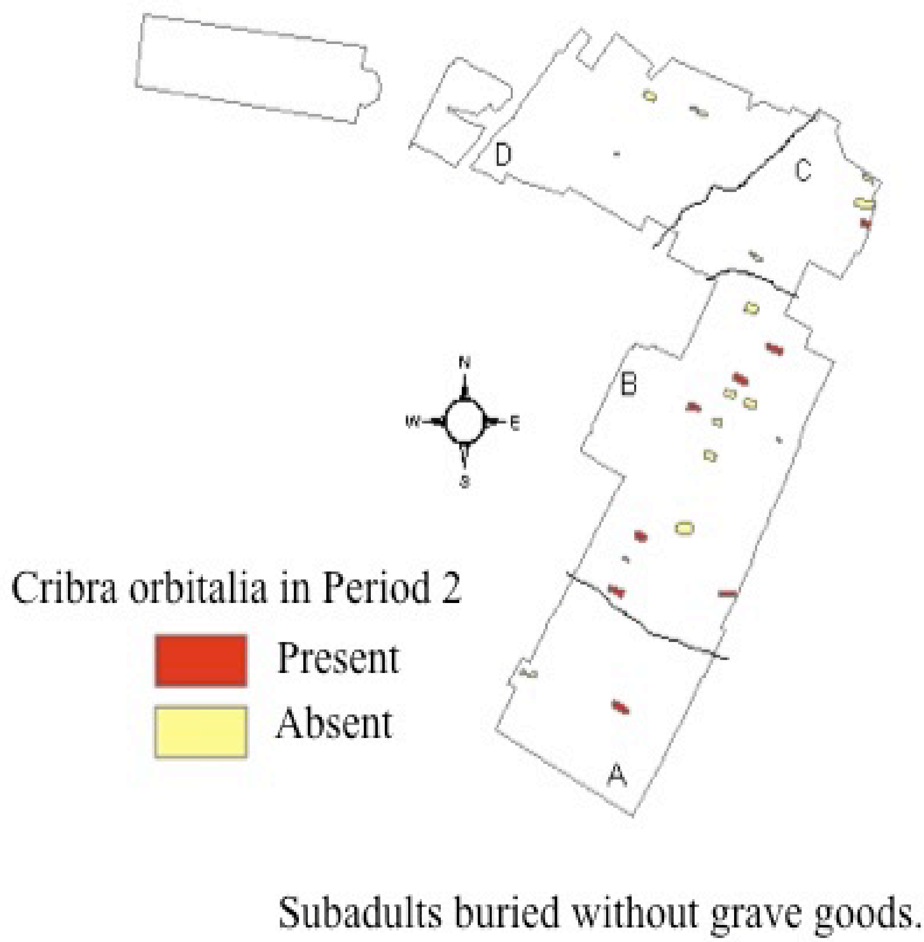


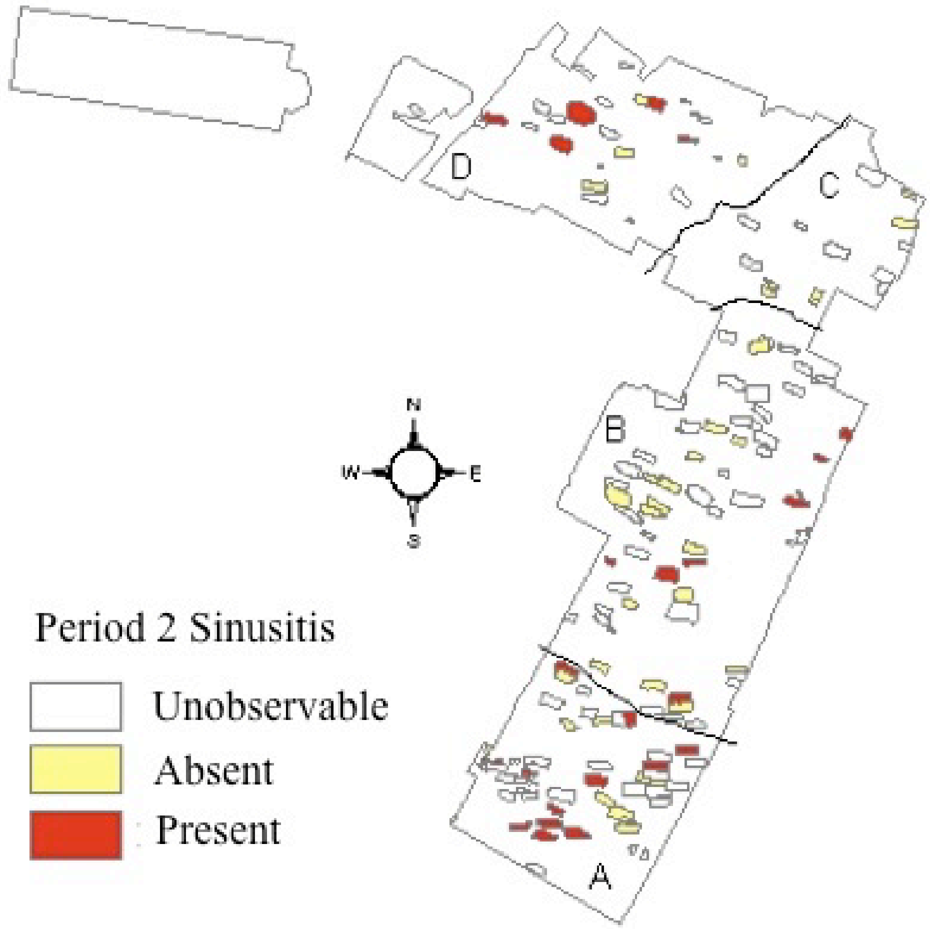
Figure 78: Subadults without Grave Goods with Cribra Orbitalia



The development of periosteal infections in this sample appears to be related to age and the sexual division of labor, as few subadults or females were affected by this condition. Periostitis of the tibia primarily affects adult males and this is reflected in the fact that this indicator primarily occurs in areas A and B, which had a higher proportion of well preserved males as compared to areas C and D. There is not a relationship between the presence of grave goods and periostitis in this sample.

Maxillary sinusitis is also relatively evenly distributed throughout the cemetery. Like periostitis, maxillary sinusitis primarily affects adults and seems to affect males and females equally. Although there is not a relationship between maxillary sinusitis and the presence of grave goods, there may be a relationship between household membership and sinusitis. One particularly visible cluster of individuals with maxillary sinusitis occurs in Area A at the south edge of the cemetery. If these individuals represent the same household or family group, they may have shared living conditions, resulting in infections in all the adults in this group.

Figure 79: Period 2 Maxillary Sinusitis Distribution



Age and Sex

The distribution of individuals by age and sex indicators provides insight into group identity. In Period 1, groups of burials are arranged in clusters across the cemetery area. These groups probably represent family/household areas within the cemetery. This trend appears to continue into Period 2 although the groups become much more densely packed.

Although burials do appear to represent family groups, they do not reflect the organization of modern Christian cemeteries. Husbands and wives are frequently buried next to each other in modern cemeteries, but there is less evidence of this practice in the Butt Road cemetery. Male/female paired graves do occur within this sample, but males and females are also buried next to subadults or other males and females respectively. This suggests that burial within family groups was based on order of death rather than reserving spaces for the surviving spouse as is common today.

There is an interesting pattern in Period 2 in the distribution of subadults. Subadults tend to be buried near each other, especially children under the age of five years. The mortuary analysis of individuals based on age and sex provides some insight into local Roman views of the dead and the expression of both biological and social identities in burial practices.

Table 74: Summary of High/Low Cluster Results for Skeletal Variables

High/Low Cluster (Getis Ord General G) Results		
Skeletal Variable	**Period 1**	**Period 2**
Age Distribution	Random	Random
Sex Distribution	Random	Random
LEH	Random	Random
Cribra Orbitalia	Random	Random
Periostitis	Random	Random
Sinusitis	Random	Random

Identity in Burial Practices

Mortuary treatments within the Butt Road cemetery are consistent with Roman burial traditions. The cemetery is located outside the town walls and appears to have been located near one of the roads leading away from the town. This is typical of Roman cemeteries both in Britain and within the Empire (Toynbee, 1971). In addition, individuals buried within the cemetery appear to share the same group identity based on uniformity in grave orientation, head orientation, and coffin type. The presence of certain types of grave goods included in the graves of some individuals may reflect aspects of their individual identities or the views of the agents responsible for their burials. In addition, the distribution of individuals within the cemetery based on age and sex also provides insight in cemetery organization and possibly family structure. The decision to bury individuals in specific areas of the cemetery or exclude them from the cemetery altogether provides insight into the role of identity and agency in the treatment of the dead.

Many authors have noted the under-representation of subadults, especially infants, in Roman period cemeteries (Mays and Faerman, 2001). Preservation likely plays a major role in archaeologists' ability to locate and recover infant remains within cemeteries. In the case of the Butt Road cemetery, infants and even infant-sized graves appear to be underrepresented in the excavations. While five infants are included in this sample, only 12 infant skeletal remains were recovered in the entire cemetery. In addition, 20 graves presumed to represent infants were excavated but did not contain skeletal remains. This results in a sample of perhaps 32 infant burials in an otherwise large and generally well-preserved cemetery sample (Crummy et al., 1993).   Excavations of Roman townhouses in Colchester resulted in the discovery of several infants at Lion Walk and Balkerne Lane (Crummy et al., 1984). These burials are described as *in situ* inhumation burials, which suggests that they were associated with houses (Crummy et al., 1984). The discovery of these burials may help to explain the underrepresentation of infants within formal cemeteries such as Butt Road.

Roman families were not encouraged to hold elaborate funeral rites or openly mourn dead newborn infants (Dixon, 1992).   As a result, Roman burial customs allowed infants to be buried within city walls while all other individuals were to be buried in the formal cemetery (Golden, 1988).

The Romans are not the only cultural group to develop burial practices and funeral traditions designed to help both society and individuals cope with the death the very young.

Murphy (2011) examines how modern and past societies deal with stillborn and unbaptized infant deaths. Murphy (2011) uses both archaeological evidence from Early Modern Ireland and ethnographic accounts of miscarriages and infant deaths to understand how parents, especially mothers, cope with failed pregnancies and infant deaths.

Irish *cillini* cemeteries for unbaptized infants occur in visible locations on the landscape and appear to be frequently visited by the parents and other family members (Murphy, 2011). The Roman custom of burying infants near the home may be a similar strategy for parents to cope with the loss of an infant privately. The burial could be visited on a regular basis without censure from the rest of society. This explanation for infant burial location is consistent with historical knowledge of Roman views on infant death (Scott, 1999; Dixon, 1992).

When the burial treatment of subadults from the Butt Road cemetery is examined, there does appear to be greater attention to subadult burials than adult burials. In the Period 2 of the Butt Road cemetery, 42% of the individuals buried with grave goods were subadults. In contrast, only 7% adult males and 8% of adult females were buried with grave goods. This suggests that the inclusion of grave goods may have been a physical expression of mourning the death of children.

Burial location also appears to be related to age. In areas A and B, there is a tendency for subadults, especially young children and infants, to be buried close to each other. These groupings are not dense enough to suggest that areas of the cemetery were reserved only for children. However, burial location was likely dictated by order of death within families.

The Romans were a patriarchal and patrilineal society (Hanson, 2010). When an individual died, his or her family was responsible for ensuring the deceased received a proper burial (Patterson, 1992). However, kin groups could extend beyond individuals who shared common ancestors to include servants and other members of the household (Hanson, 2010). Women served as connections between kin groups since they retained economic and legal connections to their own family even after marriage (Hanson, 2010). At the same time though, women were also incorporated into their husband's family and as a result their social identities shifted from their father to the their husband. This is often reflected in the epigraphs for Roman women where they are identified by their relationship to men as daughters and wives (Petts, 1998).

Given Roman emphasis on family or household relationships, Roman period cemeteries may contain family groupings clustering around a focal point. Petts (1998) suggests that this is usually a founding member of the family within the cemetery. Furthermore, age, sex, and social relationships may have dictated where subsequent individuals could be buried in relation to the founder.

However, the Butt Road cemetery does not exhibit graves clustered around focal graves. Instead, graves in both temporal periods are organized in rows. The density of rows in Period 1 is quite variable, but this may represent family groups within the row structure. On the other hand, several graves appear to be in isolation, these may have been individuals with low status or with little or no family connections within the town. In Period 2, the rows appear to become much more regulated. The demographic distribution within Period 2 suggests that there was a preference to bury children near one another if possible.

Increased organization of family group burials may reflect the need to use cemetery space more efficiently as towns lost control of hinterland during the late 4th century. Philpott (1990) suggests that local Roman officials began to take over cemetery organization and maintenance in an effort to control the spread of cemetery space close to towns. Many towns, including

Colchester, appear to shrink in size in the 4th century and begin to use land closer to their walls for cemeteries. This decision may reflect instability within Roman territories as new ethnic groups from the continent began to move into Britain (Dark, 1994).

In addition to the political instability in the western portion of the Roman Empire, the 4th century AD also marks the beginning of mass conversion to Christianity. The changes in burial practices in cemeteries such as Butt Road have gained a great deal of attention from scholars such as Watts (1991) as being a means of identifying Christian converts in the archaeological record.

Identifying Christian Burials?

There is archaeological and textual evidence that Christianity reached Britain sometime early in the 3rd century, but the degree to which Christianity influenced Britain in the 3rd and 4th centuries is unknown. Many authors, including Watts (1991), have attempted to develop diagnostic criteria to identify Christian burials. However, the problem with these criteria is they tend to focus on "normal" burials and ignore mortuary variability within cemeteries (Petts, 1998). Many of the criteria used by Watts (1991) rely on over-simplification of the mortuary data from cemeteries such as Butt Road. Other criteria, such as the lack of decapitated burials, no longer stand due to more recent excavations. An overarching problem with these attempts is that they ignore the wide range of social identities expressed, by both the living and the dead, during funeral rituals and burial (Petts, 1998).

While religious beliefs may influence funeral rituals, these beliefs are not directly tied to archaeological evidence that can be recovered from burials (Morris, 1992). Burial practices are also used to express family relationships, gender roles, social status, and group and individual identities. In addition, the same religious beliefs can be expressed in a variety of religious practices (Petts, 1998; Young, 1975). In the case of early Christianity, compromises between religious belief and local burial practices frequently took place in Germany, France, and most likely Britain (Young, 1975; Petts, 1998).

This would have resulted in the development of many local Christian identities so it is unlikely that this variation in Christian identity would have adhered to a uniform Christian burial practice in the 4th century AD. For example, the burials of individuals documented in historical texts as Christian converts still included grave goods and other non-Christian features well into the 6th century AD (Young, 1975). Eventually, the Church became strong enough throughout Europe to reorganize community relationships that had previously been based on a secular patron/client system to focus on the bishops and martyrs (Petts, 1998:119). The church encouraged more systematic burial plans that deemphasized family relationships and emphasized equality in the eyes of God. However, this interference by the Church does not appear in some parts of continental Europe and Britain until well into the medieval period (Petts, 1998).

It is possible that the Butt Road cemetery reflects the beginning of Christian influence on burial practices, however the distribution of individuals based on age and sex is still consistent with Roman burials practices, which were generally based on family or household relationships. While it is still unclear if individuals at Butt Road identified themselves as Christians, they shared a local Roman identity that appears to have contributed to low levels of skeletal stress.

In order to better understand how local Roman identity, in conjunction with local environment and living conditions, can influence skeletal stress within a population, the Butt Road cemetery sample is compared to three other contemporaneous Romano-British skeletal samples.

The Effects of Local Identity and Environment

While the Butt Road skeletal sample appears to suffer from low levels of skeletal stress, comparisons with skeletal samples from contemporaneous cemeteries suggest that there were significant differences in stress levels between Romano-British communities. This study compares the Butt Road skeletal sample with two Roman period skeletal samples from London; Roman South and Roman West; and the Bath Gate cemetery from Cirencester. All of these cemeteries were in use over roughly the same time period (1st to 4th centuries AD). The communities associated with these cemeteries reflect different local Roman identities based on their political and economic roles within Britain and the Empire. Colchester was founded as a military colony and appears to have been a religious center for the imperial cult to the Emperors in Britain. It may have been an important local economic center but was superseded in political and economic importance by London in the 1st century AD. London was the largest town in Britain and served as the administrative capital, in addition to being an important port in the economic network between Britain and the rest of the Empire. Finally, Cirencester was founded as a local administrative center to integrate local Britons into Roman rule. A Roman military fort appears to be associated with Cirencester and the Bath Gate cemetery.

In addition to differences in local identity, there are also distinct differences in the local environments associated with each of these communities. The combination of local identity and environment may have resulted in distinct differences in skeletal stress levels within these communities. Table 75 and Figures 80 and 81 summarize the results of this comparison (detailed in Chapter Seven).

Table 75: Summary of Inter-Site Skeletal Results [1]

	Roman South			Roman West			Bath Gate		
	Females	**Males**	**Subadults**	**Females**	**Males**	**Subadults**	**Females**	**Males**	**Subadults**
LEH	+	-	+	+	+	-	-	-	-
Cribra Orbitalia	+	+	+	+	+	+	-	-	-
Periostitis	-	-	-	-	-	-			
Sinusitis	-	-	-	-	+	-			
Long Bone Length	-			-	+		-	+	

[1] Plus symbols (+) indicate significant differences at the p=0.05 level between the Butt Road sample and the comparative sample. Minuses (-) indicate no significant differences. Empty cells indicate that no comparison was made.

Figure 80: Frequency of Skeletal Stress Indicators in Adults (Inter-Site)

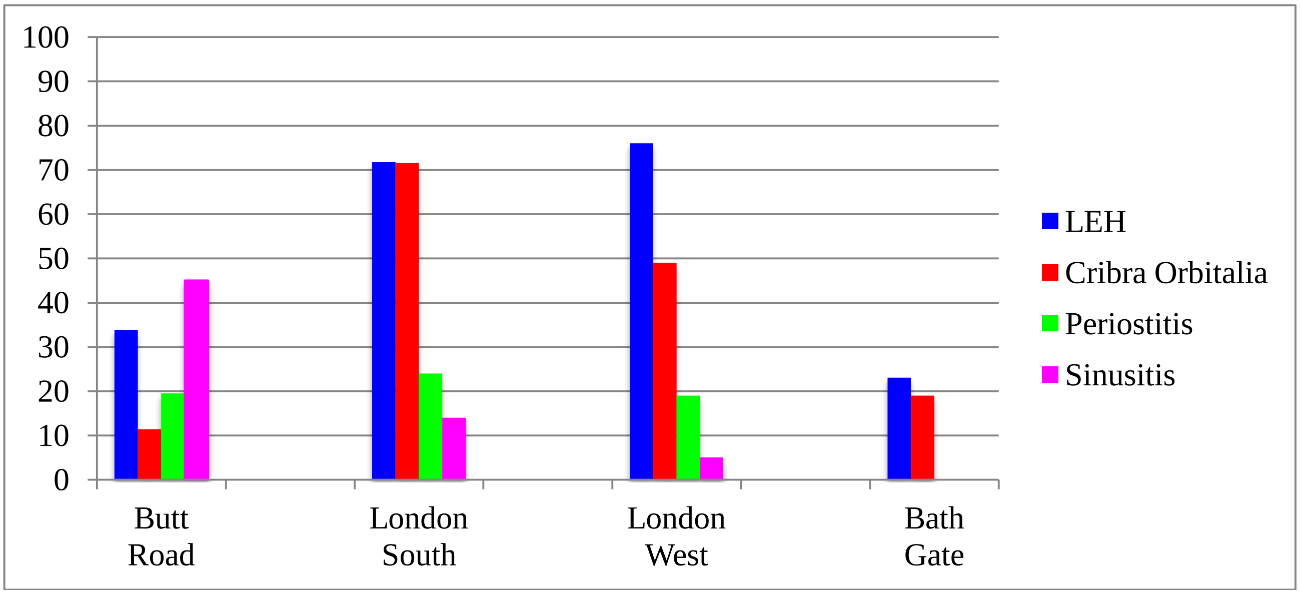
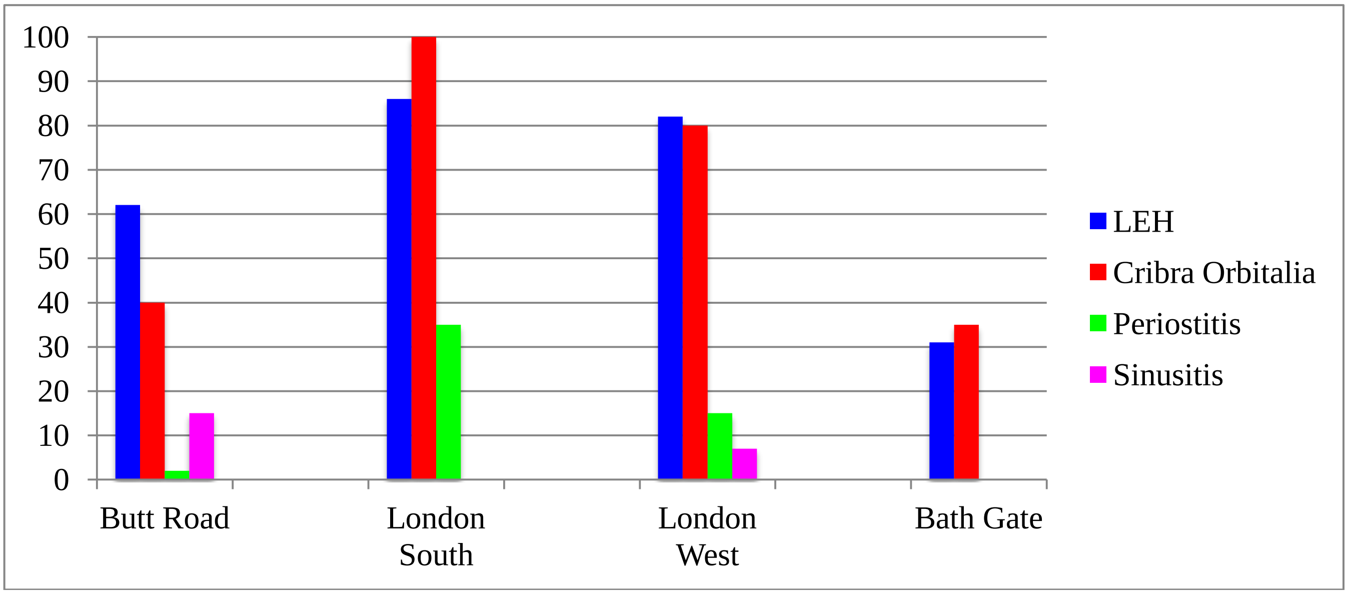


Figure 81: Frequency of Skeletal Stress Indicators in Subadults (Inter-Site)



There are many significant differences in the presence of skeletal stress indicators between the Butt Road skeletal sample and the skeletal samples from London. However, Butt Road and Bath Gate appear to have experienced similar levels of physiological stress, especially as children. As discussed in Chapter Seven, differences in community size and organization may help to explain the difference in skeletal stress visible in these samples. By examining the etiologies of the skeletal health indicators included in this study in relation to environmental and cultural stressors and cultural buffers available in Roman Britain, and specifically within these communities, it may be possible to develop a better understanding of skeletal stress and community health as it is expressed in these samples.

Skeletal Stress In Childhood

Linear enamel hypoplasias (LEHs) represent a disruption in the secretion of dental enamel during the development of permanent tooth crowns in early childhood (Ritzman et al., 2008). This enamel defect is the result of systemic physiological stress that can be related to malnutrition, infectious disease, and metabolic disorders (Novak and Slaus, 2010). These defects remain visible throughout an individual's life and provide a means of measuring the effects of childhood stress even in adults. Although many individuals with LEHs do survive to adulthood, there does appear to be a link between LEHs and early death. The event(s) responsible for the formation of LEHs may have weakened individuals' immune systems and made them more susceptible to later infections from which they were unable to recover (Boldsen, 2007).

When the presence of LEHs are considered in the Butt Road skeletal sample and the comparative samples from London and Cirencester, there are some interesting results. LEHs affect 62% of subadults and 33.8% of adults from the Butt Road sample. In contrast, 86% of subadults and 75% of adults from Roman South had LEHs while 82% of subadults and 76% of adults from Roman West had LEHs present on their anterior teeth. There were significant differences in the presence of LEHs between Butt Road and the London samples for all demographic groups except males from Roman South (see Table 74 for a summary of results).

These results suggest that there were significant differences in early childhood health between Colchester and London. While the adults from these samples may or may not have been raised in these communities, it is likely that the subadults in these samples lived most of their lives in Colchester and London respectively. While it is unclear exactly why subadults and adults from London experienced more stress early in childhood, these differences may be tied to differences in living conditions, parasite infections, and the quality of diet between these communities.

In contrast, there are not significant differences between the Butt Road sample and Bath Gate. Bath Gate has the lowest frequencies of LEHs of the comparative samples. Only 31% of subadults and 23% of adults have evidence for LEHs on anterior teeth. There are several confounding factors associated with these results. The origins of the adults associated with this cemetery are also unknown. If this sample does represent a portion of the Roman army, then these adults, especially the males, could have come from the other areas of the Empire reflecting the health of their birth communities rather than Cirencester. While subadults may be more representative of life in and around Cirencester, this sample also included more infants than any of the other samples and these individuals would have been too young to develop LEHs before death. The data available on LEHs from the Bath Gate skeletal sample is also problematic which may also contribute to these results. However, there appears to be clear differences in skeletal stress and health between these communities beginning early in childhood.

While LEHs can provide insight into stress very early in childhood, other skeletal indicators, such as cribra orbitalia, can provide insight into stress and dietary deficiencies as individuals mature. Cribra orbitalia normally affects subadults at higher frequencies than adults, although when cribra orbitalia is present in adults, females are more frequently affected than males (Sullivan, 2005). Cribra orbitalia has long been associated with acquired iron deficiency anemia, but more recently this explanation has been called into question. Walker et al., (2009) suggest that cribra orbitalia may have a very complicated etiology related to vitamin C and vitamin B12 deficiency (Walker et al., 2009).

The Butt Road sample has low levels of cribra orbitalia in adults and subadults suggesting that dietary deficiencies were relatively rare in Roman Colchester. Cribra orbitalia affects 40% of subadults and only 11.4% of adults. Only three females and three males were affected by cribra orbitalia. The subadults affected by cribra orbitalia ranged in age from early childhood to early adolescence.

In contrast, the London samples have surprisingly high frequencies of cribra orbitalia, especially among the adults. In Roman South, 100% of subadults and 71.5% of adults displayed evidence of cribra orbitalia. In Roman West 80% of subadults and 49% of adults are affected by cribra orbitalia. There are significant differences between males, females and subadults from the Butt Road cemetery and males, females, and subadults from both Roman South and Roman West respectively.

The Bath Gate cemetery sample is very similar to the Butt Road sample with 35% of subadults and 19% of the adult sample affected by cribra orbitalia. There is not a significant difference between Butt Road and Bath Gate in the presence of cribra orbitalia.

While the Butt Road and Bath Gate samples indicate that dietary stress was sometimes experienced in childhood, by adulthood most individuals appear to have had access to an adequate diet and any evidence for cribra orbitalia had remodeled prior to death. The London samples reflect a population with much higher dietary stress levels, possibly compounded by higher levels of parasitic infection (Allason-Jones, 1999). Almost all of the subadults and many of the adults from the London samples have evidence for cribra orbitalia. While this study does not compare active versus healed cribra orbitalia, the presence of even healed cribra orbitalia in adults from London suggests that many individuals experienced dietary stress for longer periods of times than those individual living in Roman Colchester and Cirencester. Differences in diet may help to explain these results.

The availability of nutritious food sources is an important consideration for cribra orbitalia since there seems to be a strong link between vitamin and mineral deficiency and this stress indicator. Vitamin C is found in many fruits and vegetables, such as citrus fruits and cabbage (Insel et al., 2010). Vitamin B12 is supplied by animal food products including; eggs, milk, fish, poultry, and meat (Insel et al., 2010). While foods rich in B12 are generally available all year, in temperate climates, access to Vitamin C may decrease in the winter. Food preparation techniques also affect vitamin content and the digestive tract's ability to absorb nutrients (Insel et al., 2010)

Excavations from Roman Colchester indicate that the town had access to a diverse and high quality diet, including foods rich in vitamin C and B12 (Crummy, 2001). Zooarchaeological remains from Colchester indicate that beef, pork, mutton, poultry, eggs, and shellfish were consumed at the site (Crummy, 2001). Evidence for wheat, barley, and lentils has also been recovered from the Roman town. Excavations indicate that cabbage, onions, leeks, elderberries, figs, various nuts, dates, and plums were available as food sources. Furthermore, with exception of olives and dates, all foods were locally grown (Crummy, 2001). Excavations in and around Colchester suggest that some houses had kitchen gardens and that there was agricultural space within the town wall used for grain production (Crummy, 2001). Perhaps many people in Colchester had direct access to agricultural land (either inside or outside the town walls) and so households were better able to produce and store their own food.

It appears that adequate nutritious food was available from the local environment at Roman Colchester. However, it is likely that social status, age, and sex may have affected access to certain types or quantities of food that could still result in dietary insufficiencies in some individuals. While the same types of foods were available in Roman London, there appears to be clear differences in access to these resources between communities. Rowsome (2000) suggests that many people living in Roman London would have purchased their food rather than producing their own. The cost of food sources may have resulted in some individuals relying on a less diverse or lower quality diet resulting in more pronounced differential access to food sources in London than in Colchester.

Access to an adequate diet and other resources during critical periods of growth and development is crucial to individuals achieving their genetic potential for height. Comparisons of maximum long bone length provide a means of examining the overall effects of environmental and cultural stress on growth and development. Small stature has been interpreted to reflect long-term deficiencies of environmental resources (Fuller et al., 2006). However population origins and differences in population genetics related to potential height can complicate these comparisons.

At Butt Road, the maximum femur length mean is 440.44mm for males and 402.75mm for females. These means are smaller than the means from the comparative samples. No males from Roman South have intact femora but females have a mean at 434.4mm (N=4). Roman West males have a mean of 463.3mm and females have a mean of 429.5mm. Bath Gate males have a mean of 450.96mm and females have a mean of 416.7mm.

While sample sizes makes comparing long bone length difficult for several of the samples included in this study, there are some interesting trends in these comparisons. Both London samples and the Bath Gate sample have larger means for maximum femur length than the Butt Road sample with respect to both males and females. However, the only significant differences are between Butt Road males and Bath Gate and Roman West males. Although the female maximum bone lengths were larger in both London samples and the Bath Gate sample, these differences were not statistically significant.

Using stature estimate formulae based on modern samples is problematic, but these equations are commonly used in health studies. Using the formulae from Trotter (1970), Butt Road mean statures are 166cm (5 feet 5 inches) for males and 154.3cm (5 feet) for females. These statures are not that different from other reported statures from Roman Britain. Stature estimates for the Roman cemetery at Queenford Farm, Oxforshire place males at 168cm and females at 158cm (Fuller et al., 2006).

The results of this comparison suggest that the difference in long bone length between these communities may reflect a difference in population migration/genetics rather than a difference in the overall effects of stress on growth. It should be noted though, that the sample sizes for females from both London cemeteries are very small and may not represent the London population as whole. Population migration from other parts of the Empire may play a role in the differences in long bone length between these sites. Differences in nutrition and stress at critical growth periods in late adolescence may also be a factor. The London samples appear to experience higher levels of stress in early childhood based on LEHs. The evidence of cribra orbitalia well into adulthood suggests that dietary stress remained a problem throughout growth and development. As a result, it is unlikely that the London samples would have recovered sufficiently in adolescence for their overall growth/stature to not be affected by these early stressors. It seems more likely that these differences between Butt Road and these other communities represent differences in population genetics or population origins.

The differences in adult long bone length between these communities may also represent differences between civilian and military populations. The Bath Gate sample appears to have a strong military association and it is possible that the males buried in the Bath Gate cemetery were members of the Roman army. If this is true than they may represent a specially selected portion of the population.

The Roman army appears to have had some height requirements for recruits. Ideally, recruits would be at least 5 foot 7 inches, between the ages of 19 and 25, and physically fit (MacDowell, 1994). However the height requirement appears to have been overlooked frequently and eventually abandoned as the army began to have trouble maintaining its numbers (MacDowell, 1994). In the case of the Bath Gate male sample, the mean maximum femur length is 450.96 mm. Using the Trotter (1970) equation for white males, this would be around 5 feet 5 inches, slightly under the 5 foot 7 inch ideal. However, the idea behind this requirement suggests that the Roman Army did have a strong preference for larger individuals if possible.

The comparisons of LEHs and cribra orbitalia between Butt Road, London, and Bath Gate samples indicate distinct differences in childhood health between these communities. The interpretation of long bone length is more complicated but indicates a difference between communities that may be related to identity and origins, especially among males.

Skeletal Stress in Adults

Maximum long bone length, cribra orbitalia, and LEHs provide insight into skeletal stress experienced during growth and development. However, other skeletal stress indicators primarily affect individuals after reaching adulthood. Non-specific infections, such as maxillary sinusitis and periostitis of the tibia are related to long-term exposure to pollutants or infections and primarily affect adults. By comparing these non-specific infections, it is possible to gain insight into differences skeletal stress experienced by individuals as adults (presumably while they were living within their respective communities).

Periostitis can be the result of either local or systemic infection and may be related to injuries or excessive biomechanical stress to the lower limbs (Ortner, 2003). The degree of healing present in an individual with periostitis may also be an indicator of immune function and social stress levels within populations.

The immune system has a complicated and poorly understood relationship with psychosocial stress and social support systems. While there are no clinical studies on periostitis and psychosocial stress, clinical studies have shown that social support networks play a major role in immune function (Evans et al., 2007; Uchino, 2006; Cohen, 1988). Studies have found that social stress can decrease the immune system's ability to function and in turn, good social support networks can help improve immune function (in the case of AIDS patients) (Uchino, 2006). In bioarchaeological samples, periostitis often increases in frequency within populations undergoing cultural transitions such as the adoption or agriculture or increased population density (Goodman and Martin, 2002).

When periostitis is considered for the Romano-British samples included in this study, it is relatively low in frequency. Only 2% of subadults and 19.5% of adults with observable tibiae are affected by periostitis in the Butt Road sample. The majority of individuals affected were males. Periostitis is also rare in the London samples. At Roman South, 35% of subadults and 24% of adults have evidence for periostitis. While at Roman West 15% of subadults and 19% of adults were affected by periostitis. Periostitis is not included in the analysis of the Bath Gate cemetery because the number of individuals with observable tibiae is not available from the site report. However, a number of males from this site have evidence of traumatic wounds affected by periostitis (Wells, 1982). In addition, Wells (1982) reported 26 individuals (18 males, 7 females, and 1 unsexed individual) with periostitis on lower leg bones (Wells, 1982:182). The proportion of males and females affected by periostitis at Bath Gate is consistent with the patterns seen at Butt Road and Roman West. Males and females from Roman South had similar rates of periosteal reaction. With the exception of subadults from Roman South, periosteal infections were rare in subadults from these samples.

Based on the results of this comparison, males appear to be more likely to develop periosteal reactions on their long bones than females. While this may represent a difference in social stress, the results of other non-specific infections such as maxillary sinusitis suggest the males and females have similar immune responses to other infections. So the difference in periostitis may be related to the division of labor between males and females.

The significant difference in the presence of periostitis between males and females is consistent with other Late Roman samples, such as Colonia Iulia Iader in Croatia, where researchers have also attributed the significant difference in the presence of periostitis between males and females there to the sexual division of labor (Novak and Slaus, 2010). Male workers were generally responsible for fieldwork and other heavy manual labor outdoors while females were responsible for the production of domestic goods such as textiles and child care (Roth, 2007)

While males and females appear to have different labor roles, they have very similar frequencies of other non-specific infections such as maxillary sinusitis suggesting that both males and females were exposed to poor indoor air quality for long periods of time and had similar levels of dental health. Maxillary sinusitis is often the result of inflammation and infection of the sinuses due to the common cold, allergies, and upper respiratory infections (Gwaltney, 1996). Poor air quality, including dust, smoke, and fungal spores can cause inflammation in the upper respiratory tract and can predispose individuals to developing infections (Roberts, 2007). Maxillary sinusitis also has a strong relationship with dental health. An oro-antral fistula into the maxillary sinus indicates the spread of dental infection into the sinus. Oral bacteria can be transmitted to the sinuses via the pharynx as well (Liebe-Harkort, 2010).

Maxillary sinusitis was surprisingly frequent within the Butt Road sample of adults although it was rare in subadults. While developmental changes related to dentition can make it difficult to identify pathological changes in the sinuses of subadults, three subadults did have evidence for maxillary sinusitis in the Butt Road sample. Males and females were nearly equally affected, with 45% of males and 50% of females exhibiting evidence for maxillary sinusitis in the Butt Road sample.

Maxillary sinusitis also affects individuals from the London and Bath Gate Samples, although the frequency of sinusitis in these comparative samples is problematic, as discussed in Chapter Seven. One adult from Roman South and two adults from Roman West were reported to have maxillary sinusitis. At Bath Gate, seven adults (4 males and 3 females) were reported to have maxillary sinusitis with oro-antral fistulas suggesting that at Bath Gate, dental infections played a role in the development of maxillary sinusitis (Wells, 1982:181). While a few individuals from Butt Road had evidence of dental infections spreading to the maxillary sinuses, respiratory health also appears to have played a role. Several individual with severe maxillary sinusitis had no evidence for dental disease suggesting that living conditions, especially indoor air quality, played a strong role in the development of these infections in males and females.

The development of the skeletal stress indicators is strongly related to living conditions and diet. The comparison between the Butt Road skeletal sample and the samples from London and Cirencester indicate that there were distinct differences in stress in childhood and adulthood between these communities related to differences in access to dietary resources and living conditions. By examining some of the differences in local environment and local identity between these communities, it may be possible to better understand the differences in skeletal stress levels between communities.

Life in Roman Towns

The cemeteries included in this study are associated with Roman towns. Revell (2009) suggests that the development of local Roman identity was dependent upon the development of Roman towns throughout the provinces. Existing communities integrated Roman style architecture along with pre-existing structures. These new communities followed Roman urban planning guidelines with some adjustments for climate differences and local traditions. Local landscape and environment played a role in how towns developed. As a result, each Roman town in the provinces was unique in some respects, but shared common architectural features such as fora, basilicas, baths, theaters, and temples. These public buildings were a critical component to emphasizing Roman identity through daily interactions (Revell, 2009).

Roman Colchester follows traditional Roman urban planning using a grid system while Roman London developed in a more organic fashion as smaller villages became incorporated into the city as it grew (Thomas, 2003). Both the development and location of these towns would have had distinct effects on local living conditions.

The geographic locations of these towns also contributed greatly to their roles within the Empire. Roman Colchester had been intended to be the capital of Roman Britain, buts it location on the River Colne did not allow for easy access to the sea. The River Colne is too narrow and shallow at Colchester for large ships to reach the town except during exceptionally high tides (Crummy, 2001). London's location on the north bank of the Thames allowed large ships to reach the newly established town and it quickly grew into an economic and political center in Britain (Crummy, 2001). While geographic location made London a better choice to serve as the capital of Roman Britain, it may have had a negative impact on the living conditions of its residents. In turn Roman Colchester's location made it a poor choice for an international economic center but it appears to have been situated in a location that allowed for better waste management and access to diverse natural resources resulting in a 'healthier' population.

Roman Colchester was built on the south bank of the River Colne on the upper edge of the river valley and probably beyond the river's floodplain (Crummy, 2001). The town was surrounded by pasture and agricultural land with access to timber and marine resources (Crummy, 2001). The town appears to have relied on spring-fed wells, cisterns and aqueducts for water (Crummy et al., 1984). The town was about 50 feet above the water table and was supplied with water either pumped up from springs or through aqueducts and into the town in the Balkerne Lane area (Crummy et al., 1984). The streets of the town were graveled and there is evidence that they were maintained well into the 4th century AD (Crummy et al., 1984). In addition, the town had a drainage system that appears to have emptied to the western side of the town (Crummy et al., 1984). The town's defenses included a ditch beyond the town wall and several drains appear to empty into this ditch around the town so perhaps waste was directed into this ditch. While crossing this ditch at the various gates into the town was probably unpleasant, this system may have prevented or at least reduced pollution of the town's water supply, which could reduce waterborne diseases such as dysentery and typhoid (Scobie, 1986).

In contrast, London's location on the Thames River allowed it to act as a port for imperial trade but made it a more susceptible to detrimental living conditions. The Thames must have been extremely polluted since much of the town's waste was directed to the river via a sewer system and the city relied on high tides to wash away waste (Thomas, 2003). While the river and its tributaries were probably not the main source of water for the town, the water table was higher and contamination of spring fed wells by polluted ground water may have been more of a problem as a result (Rowesome, 2000; Bhardwaj, 2003). Exposure to contaminated drinking water and raw sewage can result in high levels of gastrointestinal diseases and parasitic infections, especially in young children which explain, at least in part, the high frequencies of LEHs and cribra orbitalia in the London samples (Scobie, 1986).

Roman Cirencester is believed to be the second largest Roman settlement in Britain after London. Roman Cirencester was located at the edge of the Cotswold hills on the western edge of England between River Churn and the Thames. Its relationship to these rivers, especially the River Churn, may have made it subject to flooding (Reece, 2003). In many respects it seems to have developed along similar lines as Roman Colchester though it may have had a larger population, up to 20,000 people (Corinium Museum Website). Roman Cirencester was laid out using a grid system and Roman urban planning (Hurst, 2005). The excavation of public buildings, including a forum, a possible mosaic workshop, and an amphitheatre suggest that it functioned as a regional economic and political center. Like Colchester it had elaborate Roman courtyard style houses. However, less information is available regarding water supply, drainage, and sanitation, all of which can have significant impact of the health of town inhabitants.

In addition to geographic location and water supply of these towns, indoor environments may also have varied resulting in differences in population health. Roman house design and construction was very different from traditional Iron Age houses. Traditional Iron Age roundhouses were built from timber and wattle daub with an opening for smoke in the center (Thomas, 2003). Roman houses were rectilinear with a central courtyard surrounded by rooms (Crummy, 2001). Initially, Roman houses were built of wood but overtime timber houses were replaced with stone houses in towns like Colchester and parts of London. Iron Age style round houses continue to be used in small villages and poor neighborhoods on the outskirts of London (Thomas, 2003). While this mixture of local and Roman architecture is important to the development of local Roman identity, it must have also created differences in living conditions within and between towns throughout the provinces.

Redfern and Roberts (2003) suggest that round houses would have had poor ventilation in comparison with Roman courtyard style houses and individuals in round houses may have been exposed to more pathogens and pollutants as a result (Redfern and Roberts, 2003:121). Roman courtyard houses include several features that may have contributed to better health for of the inhabitants. These houses were typically better ventilated, especially in comparison to roundhouses. Large courtyard houses in Colchester had pressurized water supplies and drainage systems, hypocaust heating systems and private bathing rooms (Crummy, 2001). These features may have allowed inhabitants to live in a more stable indoor environment and reduced their exposure to some pathogens by making it unnecessary to visit public baths and fountains. However identity and household roles probably would have dictated who had access to these private resources.

While the Roman Empire is often credited with bringing “civilization” to the barbarians, the Roman emphasis on urban life carried with it problems associated with urban life today: overcrowding, slums, and poor sanitation. The Romans did make an attempt to address these issues, but Roman towns still would have been well below modern standards for public health and sanitation. However, differences in population size probably allowed some communities to better manage the problems associated with urban living than others simply by reducing the volume of waste. In addition, differences in geographic location, water supplies and natural drainage patterns may have predisposed some communities, such as London, to pollution and poor public health.

Community organization and local Roman identities may have also contributed to how issues of sanitation and public infrastructure were dealt with by community leaders. Dark (1994) suggests that local Roman elites were responsible for maintaining infrastructure such as aqueducts, public fountains, and sewers. The elaborate houses from Roman Colchester suggest that local elites lived within the community and it would have been in their best interests to help maintain the town. This may also have been true of Roman Cirencester. However, local elites in London may have had more challenges in developing and maintaining public infrastructure due to both the physical environment the town and higher levels of population migration to the town. It acted as both an economic and political center within the Empire and Britain. As a result, it probably had a less stable population as people moved to London from smaller villages in Britain or from other parts of the Empire to take advantage of new political and economic opportunities.

The role of religion, including Christianity, within the Late Roman period in Britain and Western Europe is also poorly understood but may contribute to other types of social support systems. Christian missionary efforts and the reorganization of communities under Church bishops appears to be relatively successful in providing food, care, and other resources to the chronically ill and destitute in Eastern cities such as Antioch (Hartney, 2004). There is very little textual evidence describing the organization of Christian communities in Britain or Gaul but it seems clear that there could be a great deal of diversity in Christian experiences throughout the Empire (Maxwell, 2006; Paxton, 2005). This could result in a great deal of variation in local identities, socio-religious support networks, and burial practices, as seems to be the case in Roman Britain.

Summary

The results of this dissertation suggest the combination of local Roman cultural practices and local environment resulted in distinct differences in population health and skeletal stress between Roman Colchester, London, and Cirencester. In the case of the Butt Road cemetery, the relative lack of variability within the cemetery suggests that the cemetery represents individuals who shared a group identity and similar socioeconomic statuses. The skeletal analysis from the cemetery appears to support this conclusion. There is a relatively random distribution of health indicators throughout the cemetery with few relationships between skeletal stress and status markers. Archaeological excavations of Roman Colchester suggest that the people living in the town had access to a diverse diet and relatively clean drinking water. The town appears to have managed public infrastructure and the disposal of waste as well could be expected during the Roman period. Roman Cirencester appears to be very similar to Colchester in terms of urban development and management. While the high levels of trauma in males and the underrepresentation of females and subadults in the Bath Gate cemetery suggest that the cemetery may not represent a civilian population, the town of Cirencester also appears to have offered adequate living conditions to minimize skeletal stress. In contrast living conditions appear to be far more variable in Roman London. London appears to have more far more problems with water quality, the disposal of waste, and access to a diverse diet. As a result, both adults and subadults from London reflect higher levels of skeletal stress beginning in early childhood and continuing into adulthood.

Chapter 9: Conclusions

The previous chapter summarizes the results of this study and discusses the effects of local identity and environment on biocultural stress at a macro-regional level in Roman Britain. The relationships between burial treatment, local group identity and religious belief are also explored. This chapter outlines the anthropological contributions of this study, its limitations, and suggestions for future bioarchaeological research.

Contributions of the Study

The present study makes several contributions to anthropology and classics. This study examines the interactions between local Roman identity and local environment to better understand the biological effects of Roman urban development in Britain. It focuses on differences in skeletal stress and life experiences of people buried near urban centers in Roman Britain and how these people expressed individual and group identity through burial treatments. The Butt Road cemetery is used as a case study to explore changes in skeletal stress over time and space. A comparison between the Butt Road skeletal sample and contemporaneous cemetery samples from London and Cirencester indicate that skeletal stress levels varied greatly between communities and may have strong ties to local identity, living conditions, and the role of community within Roman Britain's political and economic networks.

While the Butt Road cemetery has been speculated to represent an Early Christian cemetery, the lack of uniform Christian identity in the 4th century AD makes it unlikely that uniform Christian burial practices would exist during Period 2 of the Butt Road cemetery. That said, the Butt Road cemetery might represent a community in the process of integrating its traditional local burial practices with new Christian ideas. The examination of mortuary treatments and the demographic distribution within the Butt Road cemetery suggests that the family or household oversaw burial treatments of members. In general, the Butt Road cemetery appears to represent a population with the same general socioeconomic status and identity based on the lack of variation in burial treatments within the cemetery. The skeletal sample also supports this conclusion based on the random distribution of skeletal stress throughout the cemetery.

Skeletal Stress at Butt Road

The people buried in the Butt Road cemetery reflect a relatively 'healthy' population. Skeletal stress levels were generally low throughout most individuals' lives in both Period 1 and Period 2. While poor preservation in Period 1 makes it difficult to compare periostitis between temporal periods, the other skeletal stress indicators included in this study are not significantly different between Period 1 and Period 2. This suggests that the community was able to buffer biocultural stress successfully by providing adequate nutrition and care to young children preventing the development of LEHs or cribra orbitalia in childhood.

Non-specific infections such as periostitis and maxillary sinusitis are rare in subadults at this site indicating that these infections did not develop until adulthood in this population. Males and females have nearly equal levels of maxillary sinusitis suggesting that both sexes had similar immune responses to infection. Males have significantly more periostitis of the tibia than females or subadults. This is likely due to the division of labor. Males were more apt to be involved in activities that could result in an injury to the tibia. Roman women were primarily responsible for managing the household and caring for children while men were more involved in agriculture and industrial activities. This sexual division in labor probably played a major role in the development of periostitis of the tibia in males in this sample.

Spatial Distributions with the Butt Road Cemetery

While the results of the skeletal analysis of the Butt Road sample indicate that most individuals had low physiological stress levels, the distribution of individuals with stress indicators present within the cemetery can provide insight into differences in socioeconomic status within the community. This study uses ArcGIS to examine the spatial distribution of burial treatments, demographic groups, and skeletal stress indicators within the Butt Road cemetery. ArcGIS can be a useful tool for physical anthropologists to study the spatial distribution of skeletal variables at different scales within the landscape (within areas of the cemetery, the entire cemetery, or between cemeteries). In this study, skeletal stress indicators are randomly distributed throughout the cemetery. However the demographic distribution of individuals may impact the distribution of skeletal stress because some skeletal stress indicators occur primarily in particular age groups. For example, the distribution of cribra orbitalia is affected by the distribution of subadults. The lack of clustering of skeletal stress indicators suggests that the people buried in the cemetery had similar access to dietary resources and lived in similar conditions.

This lack of social differentiation is supported by the mortuary analysis of this sample. Mortuary treatment is very consistent throughout the cemetery and is consistent with Roman burial practices. This suggests that the people using the Butt Road cemetery shared a local Roman identity. Although this analysis is based on a sample, the cemetery appears to contain family groups with children buried in close proximity to each other. With the exception of children under the age of six years, the placement of individuals within the cemetery appears to be based primarily on order of death within families. While young children are present in the cemetery, infants are underrepresented in the Butt Road cemetery.

The decision to bury individuals within the formal cemetery appears to be based on age at which individuals are acknowledged as members of their families and Roman society. Infants are under-represented within many Romano-British cemeteries, including Butt Road. There is evidence that infants were buried in association with houses and this may have provided parents the opportunity to mourn privately without censure from the rest of society. Infant burials in formal cemeteries may represent infants who lived long enough to be recognized by society.

In addition to exclusion based on age, several adults in the Butt Road sample appear to be excluded from the main part of the cemetery possibly because they were criminals, suspected of witchcraft, or for other social violations. One individual was decapitated while two other individuals were purposely oriented with their heads to the east, opposite from everyone else in the cemetery. They are all buried in a specific area of the cemetery beyond the boundaries of regular burial groups. This suggests that the agents managing the disposal of the dead were concerned with following Roman protocols for proper disposal of the dead but did not want these individuals intermixed with the rest of the population.

Based on the skeletal and mortuary results of this sample, the individuals buried in the Butt Road cemetery appear to have very little variation in skeletal stress. However, the development of osteobiographies for select individuals provides insight into variation in life experiences within the Butt Road cemetery by sex, age, and social status. These osteobiographies highlight the range of experiences present in the Butt Road sample. Within the skeletal sample individuals could express no skeletal stress, mild or healing indicators of skeletal stress or severe indications of skeletal stress and infection. A few individuals have evidence of trauma and chronic infections. Differences in skeletal stress do not appear to affect mortuary treatment as all individuals in the sample received the same general burial treatments. These osteobiographies indicate that overall, the people buried in the Butt Road cemetery shared many of the same life experiences and received the same general treatment in death. While the mortuary treatments within the cemetery are consistent with Roman burials practices, it is unclear if the individuals buried in the cemetery also included Christianity in their personal or group identity.

Religious Beliefs and Burials

Several authors have suggested that the change in burial practice in the 4th century AD is reflective of the conversion of Christianity. However, this explanation is not supported by other historical studies such as Young's (1975) study of Christian conversion in 6th century France. One of the biggest problems with the idea of identifying Christian burials in Late Antiquity is the lack of uniform Christian identity and Church administration during this time. Instead, there appear to be multiple Christian identities, much as there are today. As a result, it seems unlikely that these different Christian identities would conform to the same burial practices while developing their own religious practices for worship, marriage, etc. Criteria such as those suggested by Watts (1991) fail to recognize the differentiation between religious belief and religious practice. Even when people have the same general beliefs, they may express them differently within each community.

In addition to variation in the expression of religious beliefs, numerous forms of identity are expressed within burial contexts beyond religion. These identities can include biological characteristics such as sex and age, as well as social identities such as kinship, and other group identities such as being a member of the army, the roman government, or a trade/profession.

The agents involved in organizing funerals and actually burying the dead are also an important consideration in Roman burial practices and the transition to Christianity. Living agents involved in burial use burial preparations as a means of expressing their own identities in addition to that of the deceased. There appears to be a transition some time within Late Antiquity or the Early Middle Ages from secular agents controlling burial such as, families, households, or funeral clubs, to the Christian church taking over control of cemetery organization and funeral practices. However, the timing and success of this transition throughout Europe and Britain is unclear. The re-examination of burial practices in this study calls into question the ability to discern religious belief from burial practices given the diversity within Early Christianity.

The Butt Road cemetery is not the only Romano-British cemetery to undergo changes in mortuary practices in the 4th century AD. There appears to be differences in mortuary practices at other sites such as London and Cirencester that require further exploration. While this study does not include a detailed mortuary analysis between these sites, the skeletal comparison indicates distinct differences between these communities.

Local Roman Identity and Environment

This study examines the relationship between local Roman identity and skeletal stress by comparing the Butt Road cemetery to three contemporaneous cemeteries. This comparison indicates that people living in or around different Romano-British communities were confronted with very different living conditions. The geographic placement of towns contributed greatly to their ability to access fresh drinking water and dispose of waste. Towns such as Roman Colchester and Cirencester may have been at a disadvantage in terms of economic accessibility due to their inland location, but they appear to have had fewer problems with water pollution, flooding, and sanitation. In contrast, London's location on the Thames made it a better location to serve as a political and economic center but also made clean water supply and waste disposal much more challenging. The smaller population size of Roman Colchester also appears to contribute to a better living environment, as the town appears to have more control over expansions and the development and maintenance of infrastructure. In contrast, London's more organic expansion made it difficult to build and maintain city infrastructure required by its expanding population.

Butt Road and Bath Gate cemeteries have very similar levels of cribra orbitalia and LEHs while the cemeteries from Roman London reflect a much more nutritionally stressed population. Population origins and migration to urban centers also may play a role in the results of this comparison. The Butt Road sample reflects a shorter population than London or Bath Gate. However, this seems more likely to be the result of differences in population genetics rather than cultural or environmental stress given the high rates of nutritional stress in the London samples.

Limitations of this Study

This study focuses on skeletal samples from cemeteries associated with urban centers/towns. Portions of the Roman towns associated with these cemeteries have been excavated, providing insight into houses and living conditions for select segments of the population. Towns played a major role in the development of local Roman identity in Britain but much of the island's population did not live in towns. This study does not address skeletal stress or local identity in rural populations during the Roman period. While small cemeteries associated with rural villas have been excavated, no rural skeletal samples were included in this study. As discussed in Chapter One, sampling strategies may also have affected the results and conclusions of this study.

Future Research

This study provides further insight into differences in physiological stress levels and mortuary treatments in 4th century Britain. However, in order to better understand these issues, a complete reanalysis of the Butt Road skeletal collection is necessary. A comparison between the results of the complete collection and the sample used in this study would provide insight into the accuracy of sampling strategies in bioarchaeological studies.

Migration between rural and urban sites and between Britain and the rest of the Roman Empire is poorly understood. The Butt Road skeletal collection could also be used to study migration, diet, and familial relationships within the cemetery. Population origins could be studied using ancient DNA, cranial analysis of ancestry, epigenetic traits, and stable isotope analysis. Ancient DNA analysis could also be used to study familial relationships within the cemetery. Stable isotope analysis could also provide insight into dietary differences between temporal periods, age groups and the sexes.

In addition to the reanalysis of the Butt Road skeletal collection, the Bath Gate cemetery in Cirencester requires further analysis. The skeletal collection should be reanalyzed using modern data collection methods. In addition, the mortuary data, burial plans and other archaeological data should be digitized and analyzed. The Bath Gate cemetery appears to be unique among the Roman period cemeteries excavated in Britain to date. The underrepresentation of females and subadults, especially given the high number of males, several with evidence of severe trauma, suggest that the cemetery was associated with some type of military establishment. A full mortuary analysis could provide much needed insight into the agents responsible for this cemetery. As discussed in this study, it appears to have strong ties to the military and strict criteria for burial within the cemetery. Stable isotope and DNA analysis may also provide insight into the geographic origins of the individuals buried at Bath Gate.

It seems clear that physiological stress levels varied in Roman Britain based on access to resources, living conditions, and community size. However, in order to understand the cultural changes that influence health, a more complete analysis of mortuary treatments is necessary for sites such as Roman West and Roman South in London. Currently, only a few cemeteries from the same towns have been excavated, including London and York. Future excavations of cemeteries associated with Colchester and Cirencester may also provide insight into community divisions and differences in the expression of group identity.

APPENDICES

APPENDIX A

Data Codes

Table 76: Data Codes

Variable	Code in database
Skeleton	Enter skeleton number
Temporal period	1 for period 1 2 for period 2
Date	Mm/dd/year
Age	0 Could Not Be Aged 1 Infant – 1yr 2 2-5yrs 3 6-11yrs 4 12-17 yrs 5 18-25 YA 6 26-45 MA 7 46+ OA
Pubic Symphysis	Enter phase number
Auricular surface	Enter phase number
Dental Wear	Leave blank until finished
Dental development	Enter age on data sheet
Sex	0 undetermined- insufficient data 1 Female 2 Probable female 3 Ambiguous sex 4 Male 5 Probable male 6 subadult- no sex attempted
Sciatic Notch	0 Not available/not examined 1 very wide 2 wide 3 intermediate 4 narrow 5 very narrow
Subpubic Angle	0 Not available/not examined 1 absent 2 present
Ventral Arc	0 Not available/not examined 1 Absent 2 present
Ischiopubic ramus	0 Not available/not examined 1 Female 2 Male
Subpubic Concavity	0 Not available/not examined 1 absent

	2 present
Arc Compose	0 Not available/not examined 1 Female 2 Male
Nuchal Crest	0 Not available/not examined 1 almost absent 2 small 3 medium 4 robust 5 hooked
Glabella	0 Not available/not examined 1 small, almost flat 2 reduced 3 medium 4 noticeable 5 big ridge
Supraorbital Margin	0 Not available/not examined 1 Sharp 2 less sharp 3 not sharp but not round 4 rounded 5 round
Mastoid Process	0 Not Available/Not examined 1 small 2 smallish 3 medium 4 largish 5 large
Cribra Orbitalia	0 No orbits available 1 Normal 2 Affected
Orbits Available	0 None 1 Right only 2 left only 3 both right and left present
Right orbit	0 normal 1 affected
Left orbit	0 normal 1 affected
Degree of Expression	0 1 2 3 4

Activity	0 1 2 3
Periostitis	0 bone surface not scorable 1 absent 2 present
Reaction	0 None present 1 Sclerotic 2 Reactive 3 Both
Bones affected	0 None 1 Tibia only 2 Tibia + Femur 3 Multiple bones in appendicular skeleton 4 Femur
Endocranial reaction	0 None 1 Present
Skull Present	0 None 1 cranial vault available
Reaction Present	0 No 1 Yes
Type	0 1 2 3 4
Bones affected	0 None 1 Parietals 2 Occipital 3 Frontal 4 All of vault
Sinusitis	0 Not available 1 Absent 2 Present
Right/Left sinus	0 Not available 1 present
Right/Left reaction	0 absent 1 present
Related to dental disease	0 No 1 Yes
Vertebrae present	0 No 1 yes
Cervical	Number of

Thoracic	Number of
Lumbar	Number of
Sacrum	Number of
Abnormalities	0 None 1 Some present
Other observations	Duh
Linear Enamel Hypoplasia	0 No Scorable teeth present 1 LEHs absent 2 LEHs present
Tooth Presence	1 Present but not in occlusion 2 present, complete, in occlusion 3 Missing, no associated alveolar bone 4 Missing- antemortem loss 5 Missing- postmortem loss 6 Missing- congenital absence 7 Present, damaged, unscorable 8 Present but unobservable (in crypt)
Completeness of Skeleton	1 Skull/teeth only 2 Skull/teeth + thorax 3 Skeleton reasonably complete 4 No skull- post crania only 5 Legs only 6 Very fragmentary limbs only 7 very fragmentary skull + limbs
Measurements	Enter in mm with decimal places
Excavation	1 Full 2 Disturbed 3 ?Full 4 Not used 5 Not a grave 6 Section 7 Section/plan
Alignment	1 E-W 2 N-S 3 not known/recorded
Head	1 West 2 East 3 North 4 South 5 Not known/recorded

Burial Type	1 Inhumation 2 ?Inhumation 3 Cremation 4 Unused 5 Not known
Coffin Type	1 nailed timber (nt) 2 timber (t) 3 nt+plaster 4 nt in vault 5 log 6 tile 7 nt+lead+plaster 8 nt in vault +plaster 9 in another skeleton's coffin 10 lidded jar 11 None (tile) 12 ? none
Grave goods	0 absent/none 1 present in some form
Location	0 none 1 outside coffin 2 inside coffin 3 both inside and outside coffin 4 not known
Location in Grave	0 not known 1 near head 2 near feet
Grave good	Personal Adornment- # of items Glass vessels- # of items Pottery- # of items Coins Footwear Knives Textiles- presence 1 absence 0

APPENDIX B

Skeletal Indicators of Stress at Butt Road by Age and Sex

Table 77: Indicators of Skeletal Stress Period 1 Early Child (2-5 years)

Stress Indicator	Present	Absent	Total	Frequency %
LEH	0	2	2	0
Cribra orbitalia	0	0	0	0
Periostitis	0	1	1	0
Sinusitis	0	2	2	0

Table 78: Indicators of Skeletal Stress Period 2 Early Child (2-5 years)

Stress Indicator	Present	Absent	Total	Frequency %
LEH	1	1	2	50
Cribra orbitalia	3	5	8	37.5
Periostitis	1	8	9	11
Sinusitis	0	4	4	0

Table 79: Indicators of Skeletal Stress Period 1 Late Child (6-11 years)

Stress Indicator	Present	Absent	Total	Frequency %
LEH	2	0	2	100
Cribra orbitalia	0	1	1	0
Periostitis	0	0	0	0
Sinusitis	0	0	0	0

Table 80: Indicators of Skeletal Stress Period 2 Late Child (6-11 years)

Stress Indicator	Present	Absent	Total	Frequency %
LEH	6	6	12	50
Cribra orbitalia	7	7	14	50
Periostitis	0	14	14	0
Sinusitis	3	5	8	37.5

Table 81: Indicators of Skeletal Stress Period 1 Adolescents (12-17 years)

Stress Indicator	Present	Absent	Total	Frequency %
LEH	3	0	3	100
Cribra orbitalia	0	2	2	0
Periostitis	0	2	2	0
Sinusitis	0	1	1	0

Table 82: Indicators of Skeletal Stress Period 2 Adolescents (12-17 years)

Stress Indicator	Present	Absent	Total	Frequency %
LEH	4	2	6	67
Cribra Orbitalia	5	1	6	83
Periostitis	0	4	8	40
Sinusitis	1	4	5	20

Table 83: Indicators of Skeletal Stress Period 1 Young Adults (18-25 years)

Stress Indicator	Present	Absent	Total	Frequency %
LEH	3	2	5	60
Cribra Orbitalia	0	4	4	0
Periostitis	0	7	7	0
Sinusitis	1	4	5	20

Table 84: Indicators of Skeletal Stress Period 2 Young Adults (18-25 years)

Stress Indicator	Present	Absent	Total	Frequency %
LEH	3	5	8	37.5
Cribra Orbitalia	1	6	7	14
Periostitis	3	2	5	60
Sinusitis	2	4	6	33

Table 85: Indicators of Skeletal Stress Period 1 Middle Adults (26-45 years)

Stress Indicator	Present	Absent	Total	Frequency %
LEH	2	5	7	29
Cribra Orbitalia	1	4	5	20
Periostitis	0	7	7	0
Sinusitis	5	2	7	71

Table 86: Indicators of Skeletal Stress Period 2 Middle Adults (26-45 years)

Stress Indicator	Present	Absent	Total	Frequency %
LEH	8	25	33	24
Cribra Orbitalia	5	25	30	17
Periostitis	8	25	33	24
Sinusitis	9	12	21	43

Table 87: Indicators of Skeletal Stress Period 1 Old Adults (46+ years)

Stress Indicator	Present	Absent	Total	Frequency %
LEH	0	0	0	0
Cribra Orbitalia	0	1	1	0
Periostitis	0	0	0	0
Sinusitis	0	1	1	0

Table 88: Indicators of Skeletal Stress Period 2 Old Adults (46+ years)

Stress Indicator	Present	Absent	Total	Frequency %
LEH	2	2	4	50
Cribra Orbitalia	0	6	6	0
Periostitis	1	4	5	25
Sinusitis	3	2	5	60

Table 89: Indicators of Skeletal Stress Period 1 Unknown Adults

Stress Indicator	Present	Absent	Total	Frequency %
LEH	1	2	3	33
Cribra Orbitalia	1	3	4	25
Periostitis	2	6	8	25
Sinusitis	0	2	2	0

Table 90: Indicators of Skeletal Stress Period 2 Unknown Adults

Stress Indicator	Present	Absent	Total	Frequency %
LEH	7	13	20	35
Cribra Orbitalia	0	22	26	0
Periostitis	2	13	15	13
Sinusitis	6	6	12	50

Table 91: Indicators of Skeletal Stress Period 1 Young Adult Females

Stress Indicator	Present	Absent	Total	Frequency %
LEH	0	2	0	0
Cribra Orbitalia	0	3	3	0
Periostitis	0	2	2	0
Sinusitis	1	1	2	50

Table 92: Indicators of Skeletal Stress Period 2 Young Adult Females

Stress Indicator	Present	Absent	Total	Frequency %
LEH	2	3	5	40
Cribra Orbitalia	0	1	1	0
Periostitis	1	3	4	25
Sinusitis	1	3	4	25

Table 93: Indicators of Skeletal Stress Period 1 Middle Adult Females

Stress Indicator	Present	Absent	Total	Frequency %
LEH	1	0	1	100
Cribra Orbitalia	0	1	1	0
Periostitis	0	0	0	0
Sinusitis	1	0	1	100

Table 94: Indicators of Skeletal Stress Period 2 Middle Adult Females

Stress Indicator	Present	Absent	Total	Frequency %
LEH	2	13	15	13
Cribra Orbitalia	2	12	14	14
Periostitis	1	10	11	9
Sinusitis	5	5	10	50

Table 95: Indicators of Skeletal Stress Period 2 Old Adult Females

Stress Indicator	Present	Absent	Total	Frequency %
LEH	0	0	0	0
Cribra Orbitalia	0	2	2	0
Periostitis	0	1	1	0
Sinusitis	1	1	2	50

Table 96: Indicators of Skeletal Stress Period 1 Age Unknown Females

Stress Indicator	Present	Absent	Total	Frequency %
LEH	1	1	2	50
Cribra Orbitalia	0	2	2	0
Periostitis	0	1	1	0
Sinusitis	0	1	1	0

Table 97: Indicators of Skeletal Stress Period 2 Age Unknown Females

Stress Indicator	Present	Absent	Total	Frequency %
LEH	5	4	9	56
Cribra Orbitalia	0	8	8	0
Periostitis	0	6	6	0
Sinusitis	2	1	3	67

Table 98: Indicators of Skeletal Stress Period 1 Young Adult Males

Stress Indicator	Present	Absent	Total	Frequency %
LEH	3	0	3	100
Cribra orbitalia	0	2	2	0
Periostitis	0	4	4	0
Sinusitis	0	3	3	0

Table 99: Indicators of Skeletal Stress Period 2 Young Adult Males

Stress Indicator	Present	Absent	Total	Frequency %
LEH	1	1	2	50
Cribra orbitalia	1	1	2	50
Periostitis	2	0	2	100
Sinusitis	1	1	2	50

Table 100: Indicators of Skeletal Stress Period 1 Middle Adult Males

Stress Indicator	Present	Absent	Total	Frequency %
LEH	0	4	4	0
Cribra orbitalia	0	2	2	0
Periostitis	0	5	5	0
Sinusitis	3	1	4	75

Table 101: Indicators of Skeletal Stress Period 2 Middle Adult Males

Stress Indicator	Present	Absent	Total	Frequency %
LEH	6	12	18	33
Cribra orbitalia	2	13	15	13
Periostitis	6	13	19	31.5
Sinusitis	4	6	10	40

Table 102: Indicators of Skeletal Stress Period 1 Old Adult Males

Stress Indicator	Present	Absent	Total	Frequency %
LEH	0	1	1	0
Cribra orbitalia	0	1	1	0
Periostitis	0	0	0	0
Sinusitis	0	0	0	0

Table 103: Indicators of Skeletal Stress Period 2 Old Adult Males

Stress Indicator	Present	Absent	Total	Frequency %
LEH	2	1	3	67
Cribra orbitalia	0	4	4	0
Periostitis	1	3	4	25
Sinusitis	2	2	4	50

Table 104: Indicators of Skeletal Stress Period 1 Age Unknown Males

Stress Indicator	Present	Absent	Total	Frequency %
LEH	0	1	1	0
Cribra orbitalia	0	1	1	0
Periostitis	0	0	0	0
Sinusitis	0	0	0	0

Table 105: Indicators of Skeletal Stress Period 2 Age Unknown Males

Stress Indicator	Present	Absent	Total	Frequency %
LEH	2	7	9	22
Cribra orbitalia	0	12	12	0
Periostitis	2	5	7	28.6
Sinusitis	4	4	8	50

Table 106: Indicators of Skeletal Stress of Period 1 Ambiguous Individuals

Stress Indicator	Present	Absent	Total	Frequency %
LEH	1	1	2	50
Cribra orbitalia	2	1	3	67
Periostitis	1	6	7	14
Sinusitis	1	2	3	33

Table 107: Indicators of Skeletal Stress Period 2 Ambiguous Individuals

Stress Indicator	Present	Absent	Total	Frequency %
LEH	0	0	0	0
Cribra orbitalia	1	1	2	50
Periostitis	1	2	3	33
Sinusitis	0	2	2	0

APPENDIX C

Grave Goods by Age and Sex at Butt Road

Table 108: Grave Goods Buried with Subadults

Grave Good Presence	Period 1		Period 2	
Subadult Category	Present	Absent	Present	Absent
Infant (<1 year)	0	0	0	5
Early child (2-5yrs)	1	2	2	12
Late child (6-11yrs)	1	1	5	12
Adolescent (12-17 yrs)	2	3	2	6
Subadult only	1	0	0	0
Total	5	6	9	35

Table 109: Grave Goods Buried with Adults

Grave Good Presence	Period 1		Period 2	
	Present	Absent	Present	Absent
Young Adult	4	3	1	7
Middle Adult	4	4	3	38
Old Adult	1	0	1	5
Unclassified Adult	8	10	3	31
Total	17	17	8	81

Table 110: Grave Goods Buried with Adult Females

Grave Good Presence	Period 1		Period 2	
	Present	Absent	Present	Absent
Young Female	2	1	0	21
Middle Female	0	1	1	16
Old Female	0	0	0	2
Unclassified Female	2	0	2	9
Total	4	2	3	48

Table 111: Grave Goods Buried with Adult Males

Grave Good Presence	Period 1		Period 2	
	Present	Absent	Present	Absent
Young Male	2	2	0	2
Middle Male	3	2	2	19
Old Male	1	0	1	3
Unclassified Male	0	1	0	14
Total	6	5	3	38

Table 112: Grave Goods Buried with Ambiguous Adults

Grave Good Presence	Period 1		Period 2	
	Present	Absent	Present	Absent
Young	0	0	0	0
Middle	1	1	0	3
Old	0	0	0	0
Adult	2	6	0	2
Total	3	7	0	5

Table 113: Grave Goods Buried with Unknown Adults

Grave Good Presence	Period 1		Period 2	
	Present	Absent	Present	Absent
Adult	4	3	1	6

Table 114: Personal Adornment Items Buried with Subadults

Personal Adornment Items	Period 1		Period 2	
	Present	Absent	Present	Absent
Infants (<1 year)	0	0	0	0
Early child (2-5 yrs)	0	3	2	13
Late child (6-11 yrs)	0	2	5	12
Adolescents (12-17 yrs)	0	5	1	7
Subadult only	0	2	0	0
Total	0	12	8	32

Table 115: Pottery Buried with Subadults

Pottery	Period 1		Period 2	
	Present	Absent	Present	Absent
Infants (<1 year)	0	0	0	5
Early child (2-5 yrs)	1	2	0	15
Late child (6-11 yrs)	1	1	0	17
Adolescents (12-17 yrs)	2	3	0	8
Subadult only	2	0	0	0
Total	6	6	0	45

Table 116: Footwear/hobnails Buried with Subadults

Footwear/hobnails	Period 1		Period 2	
	Present	Absent	Present	Absent
Infants (<1 year)	0	0	0	5
Early child (2-5 yrs)	0	3	0	15
Late child (6-11 yrs)	1	1	0	17
Adolescents (12-17 yrs)	0	5	0	8
Subadult only	0	2	0	0
Total	1	11	0	45

Table 117: Personal Adornment Items Buried with Adults

Personal Adornment Items	Period 1		Period 2	
	Present	Absent	Present	Absent
Young Adults	1	6	1	7
Middle Adults	1	7	0	41
Old Adults	0	1	0	6
Unclassified Adults	2	16	1	33
Total Adults	4	30	2	87
No Skeleton recovered	2	13	4	15

Table 118: Glass Buried with Adults

Glass	Period 1		Period 2	
	Present	Absent	Present	Absent
Young Adults	1	6	0	8
Middle Adults	0	8	1	41
Old Adults	0	1	0	6
Unclassified Adults	1	17	3	31
Total Adults	2	32	4	86
No Skeleton Recovered	0	15	1	19

Table 119: Pottery Buried with Adults

Pottery	Period 1		Period 2	
	Present	Absent	Present	Absent
Young Adults	4	3	0	8
Middle Adults	4	4	1	40
Old Adults	1	0	0	6
Unclassified Adults	4	14	2	32
Total	13	21	3	116
No Skeleton recovered	1	14	0	19

Table 120: Coins Buried with Adults

Coins	Period 1		Period 2	
	Present	Absent	Present	Absent
Young Adults	0	7	0	8
Middle Adults	0	8	0	41
Old Adults	0	1	1	5
Unclassified Adults	0	18	0	34
Total	0	34	1	88
No Skeleton recovered	1	14	1	18

Table 121: Footwear Buried with Adults

Footwear	Period 1		Period 2	
	Present	Absent	Present	Absent
Young Adults	0	7	1	7
Middle Adults	1	7	0	41
Old Adults	0	1	0	6
Unclassified Adults	5	13	1	33
Total	6	28	2	87
No Skeleton recovered	4	11	0	19

Table 122: Personal Adornment Items Buried with Females

Personal Adornment	Period 1		Period 2	
	Present	Absent	Present	Absent
Young Adult Females	1	2	0	5
Middle Adult Females	0	1	0	17
Old Adult Females	0	0	0	2
Unclassified Adult Females	2	0	1	10
Total Females	3	3	1	34

Table 123: Glass Buried with Females

Glass	Period 1		Period 2	
	Present	Absent	Present	Absent
Young Adult Females	1	2	0	5
Middle Adult Females	0	1	0	17
Old Adult Females	0	0	0	2
Unclassified Adult Females	0	2	1	10
Total Females	1	5	1	34

Table 124: Pottery Buried with Females

Pottery	Period 1		Period 2	
	Present	Absent	Present	Absent
Young Adult Females	2	1	0	5
Middle Adult Females	0	1	1	16
Old Adult Females	0	0	0	2
Unclassified Adult Females	1	1	1	10
Total Females	3	3	2	33

APPENDIX D

Permission to Reprint Figures

Lindsey L. Jenny
712 Carom Circle
Mason, MI 48854
USA

December 13, 2011

Philip Crummy, Director
Colchester Archaeological Trust
12 Lexden Road
Colchester
Essex
CO3 3NF
UK

Dear Dr. Crummy:

I am completing a doctoral dissertation at Michigan State University entitled "A Bioarchaeological Study of Local Roman Identity: Skeletal Stress and Mortuary Treatment in the Butt Road Cemetery." I would like your permission to reprint in my dissertation the following:

Figure 2.1 Wire's plan of discoveries at Butt Road in 1845, and the likely extend of the 4th – century cemetery. (Crummy et al., 1993:6).

Burial description of Graves 41/43 Crummy et al. 1993 microfiche 338

Burial description of Grave 121 A/B Crummy et al. 1993 microfiche 407

Burial description of Grave 694 Crummy et al. 1993 microfiche 929

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If these arrangements meet with your approval, please sign the letter where indicated below and return it to me in the enclosed return envelope. Thank you very much.

Sincerely,

Lindsey L. Jenny

PERMISSSION GRANTED FOR THE
USE REQUESTED ABOVE:

____

Philip Crummy, Director
Colchester Archaeological Trust

Date: ________________________________

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